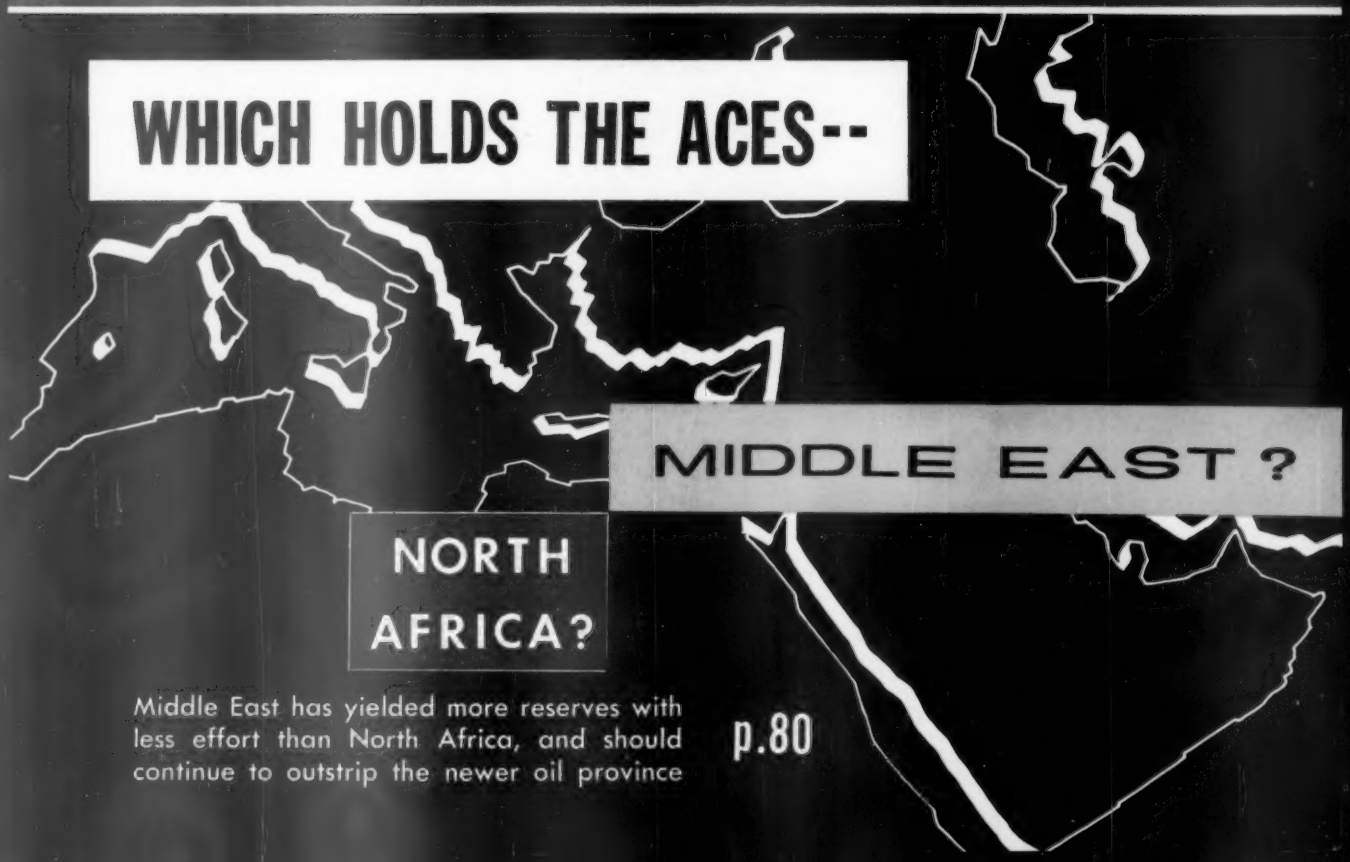
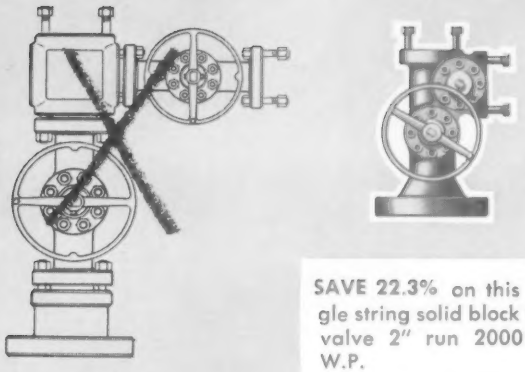
the OIL AND GAS JOURNAL
PUBLISHED WEEKLY JULY 11, 1960

Oil won't give Castro much trouble ▸ 57
Shell squeezes off water with plastic ▸ 62
Where will Russian oil exports stop? ▸ 77

WHICH HOLDS THE ACES--

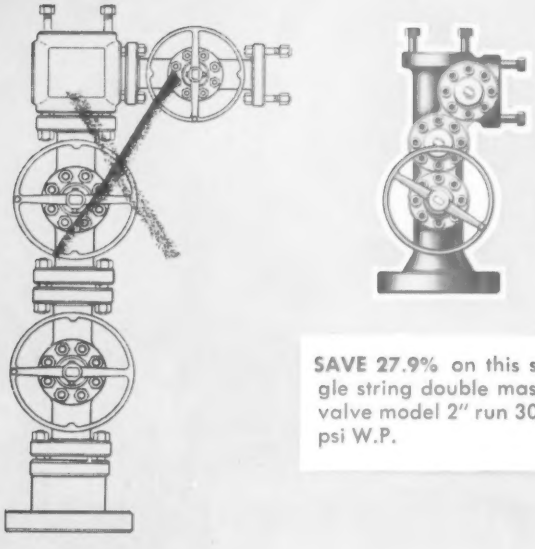


Middle East has yielded more reserves with less effort than North Africa, and should continue to outstrip the newer oil province p.80



SAVE 22.3% on this single string solid block tree valve 2" run 2000 psi W.P.

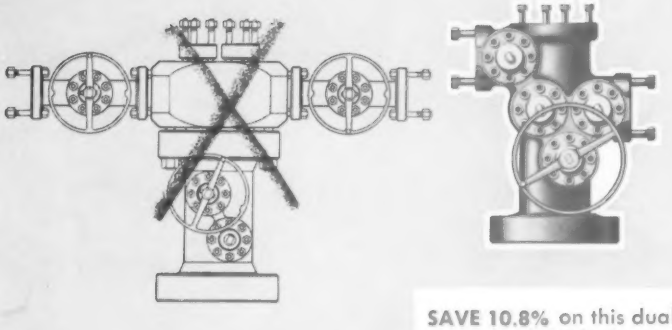
SOLID SAVINGS



SAVE 27.9% on this single string double master valve model 2" run 3000 psi W.P.

CAMERON Solid Block Tree Valves – the master valve and wing valve combinations, are producing an average saving of 21% over old style assembled trees.

This Cameron advancement eliminates most connections to bring you a safer, stronger and less costly completion – multiple or single, high pressure or low – all are equipped with regular API flanges to fit any wellhead.



SAVE 10.8% on this dual string solid block tree valve 2" run 3000 psi W.P.

Just call your nearest Cameron Representative for solid savings with Cameron Solid Block Tree Valves.

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TECHNOLOGY—OPERATION

Exploration

A Comparison of Middle East and North African Oil 80

By F. E. Wellings

The author feels that with the expenditure of the same amount of effort as applied in North Africa, the Middle East oil reserves would outstrip Africa by far. There is a greater volume of sediments to be explored in the Middle East, and reserves per volume of sediment could outstrip those of the U. S. by 6 to 1.

Refining-Processing

Sweetening Natural Gas by Selective Adsorption 86

By J. C. Fails and W. D. Harris

Selective adsorption by molecular sieves appears to be promising for the sweetening of sour natural gas. The process appears to have definite economic advantages where the reserve has high CO_2 content compared to the H_2S content. Fairly elaborate instrumentation is required but the process can be operated with a minimum of supervision.

Transformer Unit Designed for Safety 100

Unit provides 32-volt output from 120-volt input. It is used where portable lights are needed and where 120 volts may present an electric-shock potential.

Instrumentation, 3 Years Later at Tidewater's Delaware City Plant .. 110

By S. E. Roth

Three years of operation at this highly instrumented plant have proved the instrumentation system to be successful. Logging (information) systems, are extremely valuable tools constantly used by process operators.

Costimating—No. 75 105

Fuel needs of refineries since 1926.

Stainless-Steel Tank Trucks Solve Transportation Problems 120

These versatile units carry a variety of products ranging from liquid ethylene at −155° to molten anhydride at 366° F.

Drilling-Production

High Rotary Speed Shortens Bit Life and Increases Drilling Costs .. 91

By R. A. Cunningham

As a result, we do not stand our best chance of reducing drilling costs by going to high-rotary speeds. Rather, we should rely on a combination of proper weight on the bit, with moderate rotary r.p.m., and good bottom-hole cleaning.

Oil-Well Pumping—No. 5 97

By Joseph Zaba

Here are the various factors which contribute to over-all polished-rod pumping loads.

Can We Use Two Recovery Mechanisms in the Same Reservoir? ... 106

By W. B. Bleakley

Engineers of the West Bisti Gallup Sand Unit in the Four Corners area are creating a water barrier between two parts of the same reservoir. This will enable the West Bisti unit to conduct a water flood in one part of the reservoir while at the same time Sunray Mid-Continent Oil Co. conducts a miscible-phase flood in the other part.

Pipelining

Pressure Welding for Pipelines 114

By R. L. Koppenhofer, W. J. Lewis, G. E. Faulkner, P. J. Rieppel, and H. C. Cook

Tests prove induction-pressure welding is capable of consistently good girth welds, but several disadvantages seem to rule it out as a universally accepted economical means of joining large-diameter pipelines.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
July 11, 1960

What is oil's post-convention political outlook?

Unsettled is the word for it.

Current recess of Congress puts new light on outlook for some major legislation. It gives congressmen:

...More time to press for action on bills that were doomed had Congress ended its work before the Los Angeles and Chicago conventions.

...Political fodder to catch votes. There's danger in considering legislation solely on its vote-getting merits.

Thus percentage depletion may become a big issue. Oil also has a stake in what happens to the minimum wage law, a proposed fuels policy study, changes in leasing laws, and revisions in the Helium Act (p. 60)*.

▼ ▼ ▼

Other notes from the Washington beat:

An item to discuss with your congressman while he's at home is the growing use of congressional committee hearings as a sounding board for special groups with an ax to grind.

Suggest that he insist on proof of charges. Otherwise, damaging statements go unchallenged and are later quoted as gospel. If you need an example, cite last winter's Roosevelt hearings on marketing practices.

New look is given tax writeoffs for depreciation.

Considerable support is developing in treasury and the administration for a more liberal law to encourage expansion of business and industry.

Expect a lull in antitrust cases.

The agencies have made their "record" for the fiscal year which ended June 30. Now they will tend to coast, awaiting a new administration. But Justice Department may still wield its antimerger club again.

Expect renewal soon of industry cooperation with the Defense Department on oil studies. Meeting of Foreign Petro-

*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

leum Supply Committee will be held soon to set up a readiness subcommittee to work with the military.

Oil men, meanwhile, believe Castro regime can live off present supply of products until a steady supply of oil can start moving from Russian ports (p. 57).
Fleet of 18 tankers is en route from Black Sea to Cuba.

One byproduct of seizure: Secret technical refinery data has fallen into Russian hands.
The U. S. Department of Commerce has kept the material classified to prevent its use by the Russians. Castro's action now has given it into Soviet hands.

▼ ▼ ▼

Russian influence is being felt in other world oil spots.
Soviets deny they're out to break world oil-price structure. But they are making some barter deals at sharp discounts that worry marketing men (p. 77).

Red China, strangely, is not a part of this barter system with Russia. Instead China has decreed a crash program of synthetic oil development to supplement its crude output.
Chinese plans call for 600,000-bbl. daily production by 1962 of oil from shale, coal, and crude. This is five times the original target. Emphasis will be on building vast network of backyard plants to make oil from shale or coal (p.76).

▼ ▼ ▼

First-half drilling statistics show rate of completions is about 12% below first half of 1959.
Completions so far this year total 21,399 compared with 24,367 wells for 1959.
Wildcat drilling apparently has increased—4,705 this year compared with 4,641 last year (p. 165).

Technical drilling developments:

New device promising uniform cement strength throughout length of column has been tested by Halliburton. It's called the Densitroller and is a push-button controller that will keep slurry density at a preselected level (p. 68).

High rotary speeds don't offer best approach to reducing drilling costs, says one authority. Study shows high speeds shorten bit life and increase drilling costs. Best approach: Use proper weight on bit with moderate rotary speed and good bottom-hole cleaning (p. 91).

Interesting recovery technique is getting a test.
Engineers of the West Bisti Gallup Sand unit in the Four

Corners area are creating a water barrier between two parts of the same reservoir.

Result: West Bisti unit can conduct a water flood in one part of the reservoir. An oil company can conduct a miscible phase flood in the other part (p. 106).

▼ ▼ ▼

More oil in Middle East or in North Africa?

One expert feels the Middle East would yield reserves outstripping Africa by far if the same amount of effort and cash were expended there as is being applied to Africa.

The reason: Greater volume of sediments to be explored in Middle East and the reserves per volume of sediments are so large—about six times those in the U. S. (p. 80).

Interest will pick up in East Boundary Butte area of Arizona's Apache County where Humble has spotted a wildcat.

The Humble 2 Navajo is near two producers which are now shut in because of lack of market for the large gas volume. Market could develop, however, if new drilling uncovers large gas field. This could develop from rash of drilling—six other wildcats are spotted in Apache County.

New Mexico's San Juan basin is one of the most active exploratory areas in the country this summer.

There's new interest on the basin's east side where Intex Oil Co. apparently has a better producer than the discovery well at Gallina.

Sinclair has found its first oil in Colombia with a successful wildcat in middle Magdelene Valley. The Santos 1 flowed 37°-gravity oil in a test of one zone, and other zones are being tested. Sinclair holds a 215,060-sq.-mile concession jointly with International Petroleum.

▼ ▼ ▼

Of interest to marketers is word that Humble may be marketing gasoline in Oklahoma by October.

Two Humble agents have been quietly traveling the state for 5 weeks checking on outlets which might be bought. So far no deals have been reported.

Oklahoma is one of nine mainland states where Humble presently does not sell gasoline.

Processing engineers will be interested in a technical report that selective adsorption by molecular sieves is promising way to sweeten sour natural gas.

Process appears to have definite economic advantages where the reserve has high CO_2 content compared to H_2S. Fairly elaborate instrumentation is required but the process can be operated with little supervision (p. 86).

Market Memo

July 11, 1960

Brisk demand has pushed up gasoline prices.

All grades on the Gulf Coast are up one-quarter cent. No sales have been reported at the higher price but little is available because refiners have been holding.

Group 3 gasoline prices also are doing better. They're up one-half cent for northern shipment and one-fourth cent for local shipment.

Record demand in both May and June has sent postings higher for No. 2, gas oils, and residual fuels on the Gulf Coast. No. 2 on the Gulf is up from 8 to 8.25 cents.

The result: Bottom of the barrel of crude—the middle distillates and residual—is stronger in price than the top.

But don't ignore the danger signals—that 5% increase in crude runs in late June. The January-size crude runs in June are not justified even by this June's good demand.

Prices in the market place:

Group 3 gasoline for northern shipment firm at 12 cents and for local shipment firm at 12.5 cents...No. 2 holding at its posted 8 cents...Sellers are holding, confident of even higher prices.

Chicago prices, pushed by demand, are steady to strong at 12 cents for 91-RON gasoline...No. 2 is extremely tight at posted 8.5-cent price...Refiners are inclined to ignore local retail price battles as summer demand builds up and are holding the line for higher posted price.

Mid-Mississippi River markets are strong, caught between higher Group 3 gasoline posted prices and higher Gulf Coast spot prices...At Ark City, gasoline is priced at from the Gulf low to one-quarter cent over the low...West Memphis gasoline is priced at one-quarter to three-eighths over Gulf low.... No. 2 is firm on the river with sellers asking one-quarter over Gulf low of 8.375.

Gulf Coast markets are firm. Gasoline is bringing 11 cents for 92 RON, and No. 2 is firm at its new price of 8.25 cents...No. 6 is very tight and scarce at full $2.20 per barrel posted. Low sulfur not so firm at $2.45 due to reduced steel-mill demand.

The excess crude runs have buyers reluctant to make forward purchases at this time.

Group 3 refiners are motivated by economic necessity in their push for higher prices. They are ignoring high crude runs and high stocks in their quest for more realistic product prices.

Gulf Coast refiners, plagued by East Coast and foreign competition, have less price leverage for higher prices.

Good Wells Make Good News

July 11, 1960

SECONDARY RECOVERY – water flooding – water disposal–gas injection – pressure maintenance . . . all these activities are becoming more important every day to the profitable production of oil and gas. Here are four recent examples showing how Dowell can help operators who are engaged in these activities.

- Brazoria County, Texas Gulf Coast (Water disposal well) This well had been perforated conventionally into the Miocene sand between 2205 and 2214 feet. Before treatment, it was taking 2400 bwpd at 540 psi. Operator wanted to reduce injection pressure, and Dowell recommended Abrasijet*, Dowell's abrasive jetting service. Since 24 perforations were desired, Dowell devised a closed system to use the same sand and water repeatedly. 6500 pounds of sand in water were used to perforate 12 levels (2 holes each) in about 2 hours pumping time. Pumping rate averaged 3 bpm. Three months after treatment, well was taking 2200 bwpd at only 150 psi.

- Franklin County, Illinois (Waterflood injection well) This open hole was in a very thin (three foot) section of the Tar Springs sand at about 2060 feet. Dowell used Abrasijet followed by acid. 10,000 pounds sand in water were used with a Dowell agent–Slick Water–added to reduce friction pressure. Total jetting time was one hour and 20 minutes for each one-foot level. Jetting pressure was 2800 psi. Zone was then acidized using 833 gallons Dowell acid. Before treatment, well took only 20 bwpd at 1000 psi line pressure. After treatment, it would take 88 bwpd at 950 psi.

- St. Landry Parish, Louisiana (Gas injection well) This well had been recompleted into the lower Miocene sand between 8444 and 8484 feet. Before treatment, well would not take gas at 4700 psi. Dowell acidized using 6000 gallons Mud Acid with a silicate control agent added. 250 gallons of a Dowell temporary plugging agent were injected about one quarter of the way through the treatment to divert acid to tighter sections of zone. After treatment well was taking 25 mmcfd at 4700 psi.

- Ward County, West Texas (Water disposal well) This old oil well was converted to water disposal by setting a blank liner across the abandoned pay—11,927 to 12,207 feet—and deepening to 12,403 feet. The new open-hole Devonian section was treated with 10,000 gallons Dowell regular acid injected down 2⅜-inch drill pipe at 7.5 bpm and 4500 psi. Gravity flow injection tests, made both before and after treatment, showed an injection rate increase from 28 to 660 bwph.

Why not find out all the ways Dowell can help you make your operations more profitable. For service or detailed information, dial Dowell. Dowell services and products are available from more than 150 offices and stations in the U. S., Canada, Venezuela, Argentina and Germany. Dowell, Tulsa 1, Oklahoma.

*DOWELL TRADEMARK

Services for the oil industry DOWELL
DIVISION OF THE DOW CHEMICAL COMPANY

"Oilwell's" new super-hardened NITRILINE pump barrel is already running up records!

This new, alloy steel pump barrel (bore hardened by our own exclusive and patented Nitrocycle process) is built to last . . . and last . . . and last. It is hard on the inside, tough on the outside . . . and has a close, .001" tolerance. Although the NITRILINE is designed primarily to resist abrasive wear, with a uniform hardness layer end-to-end, it also resists mild corrosion and hydrogen embrittlement.

What operators are saying after testing in their "problem" wells —

Independent Operator, Eastern Illinois: ". . . well had ruined three other barrels in 90 days. The NITRILINE barrel ran 102 days before pulling."

Major Oil Co. Superintendent, West Texas: "We pulled the pump with test NITRILINE barrel after a 60-day run. It looked good. I remember when a 30-day run in this well was considered better than average."

Superintendent for Independent Producer, Rocky Mountains: "Even the 'Oilwell' man was surprised at the 6-month NITRILINE run. We used to replace barrels in that well almost every month."

"Oilwell's" NITRILINE barrel could be just the answer to your problems. Why not pick your most abrasive well and run your own test with this modern barrel? It is priced no higher than other so-called "hard" steel barrels, but should outperform any one of them!

You can get more information about these new NITRILINE pump barrels from the nearest "Oilwell" store or representative.

USS, "Oilwell" and NITRILINE are registered trademarks

USS Oil Well Supply Division of United States Steel

Executive Offices: Dallas, Texas
Export Offices: 30 Rockefeller Plaza, New York 20, N. Y.

Heating season ahead

Time to stabilize and improve your heating oils with FOA-2

No filter clogging. No nozzle plugging. No sludge.

These are qualities you can add to your heating oils, and at low cost, too. Result: a clean, hot, steady-burning fuel that wins added friends for your brand product.

You need only a few pounds of Du Pont Fuel Oil Additive No. 2—usually 5 to 15 pounds per 1,000 barrels—to do the job. This concentration has stabilized millions of barrels of heating and fuel oils since the introduction of Du Pont FOA-2 nine years ago.

FOA-2 solubilizes and disperses. Prevents sludge formation. Dissolves sludge which may already have formed. Reduces insoluble residue to such small particles that they flow and burn right along with the oil. *It stabilizes your product.*

Of course, FOA-2 is ashless—burns completely with the fuel, leaves no traces to foul the burner nozzle.

28 pages of facts. Our 28-page bulletin, "Du Pont FOA-2 for Diesel, Heating, Residual Fuels," contains full details on chemical, physical and performance characteristics. Ask your Du Pont Petroleum Chemicals representative for a copy, or write: E. I. du Pont de Nemours & Co. (Inc.), Petroleum Chemicals Division; Wilmington 98, Delaware.

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Better Things for Better Living
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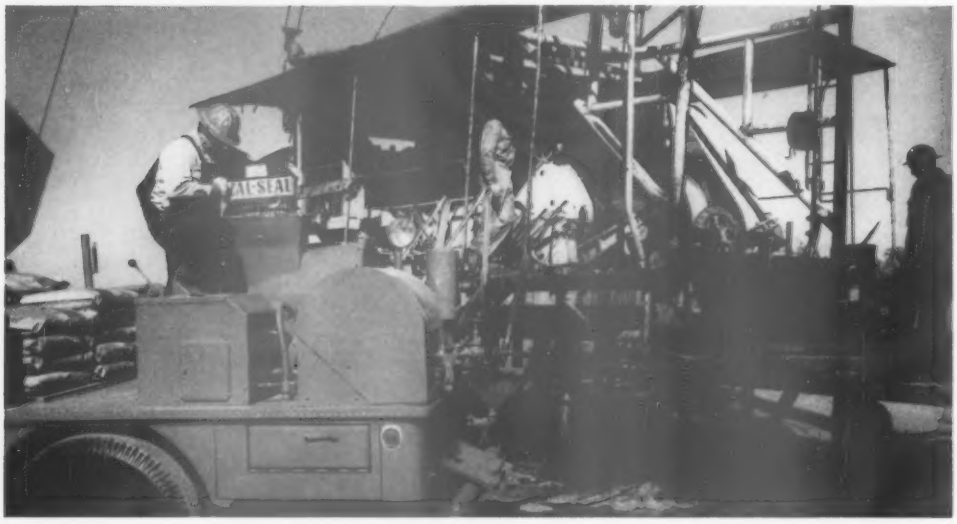
Petroleum Additives

Remedial Time-Saver

Cost of running in strings of drill pipe or tubing is saved when you have remedial cementing done by . . .

HALLIBURTON'S

dump bailer service



. . . because bailer containing cement is run in and out of hole on wire line . . . faster, more economically.

Wherever amount of cement needed is not too large and well is not too deep for bailer placement, save money by cementing with "no strings" of drill pipe or tubing. Call the world's most experienced Dump Bailer cementers.

This truck is one of the fleet of Halliburton Dump Bailer units. It carries all materials and equipment needed for Dump Bailer jobs such as . . .

Nitroglycerine shot tamps	Water shutoff
Plug back jobs	Securaloy removal
Bridge in pipe for repairs	Bridge for uphole treatments

HALLIBURTON

COMPANY • DUNCAN, OKLAHOMA

These Halliburton Products Improve Dump Bailer Cementing...

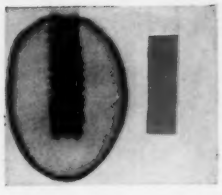
HALLIBURTON'S CAL-SEAL
EXPANDS AS IT SETS, MAKES TIGHTER PLUG

This quick-setting, super-strength gypsum cement is most popular for Dump Bailer jobs... bridge plugs, split pipe, blowouts, shot tamps. It expands 0.3% (linear) during setting which tightens plug in hole or fissure.

Cal-Seal develops a compressive strength of 2500 psi one hour after setting. The set product is readily drillable, low in permeability, easily applied and economical.

HALLIBURTON'S RESIN-CEMENT
FILTRATE PENETRATES FORMATION FOR TIGHT SEAL

Where oil production is hard to protect from fluid migration or water coning, Halliburton's Resin-Cement placed with Dump Bailer has successfully sealed troublesome formations in many wells. The fluid phase penetrates the formation, providing an impermeable seal and sets in continuity with the cement plug.



RESIN-CEMENT

HALLIBURTON HYDROMITE
A WATERPROOF PLASTIC CEMENT

Used extensively in remedial work as an overall tight non-permeable plug for plugging off bottom hole water in producing wells. Hydromite is a basic composition of a special gypsum cement and a powdered resin, and is especially adapted to Dump Bailer operations.

Hydromite has a controlled setting time from 75 to 100 minutes over a temperature range from 60°F. to 225°F. A compressive strength of 1500 psi is obtained within ten or fifteen minutes after initial set, permitting further dumping of material into the well almost immediately. Full compressive strength (approx. 4000 psi) is obtained in from 3 to 20 hours, depending on well temperature.

Can be placed in well by either Dump Bailer, or mixed through jet mixer in same manner as for squeeze operations.

HALLIBURTON'S "DB" BRIDGING BASKET
HELPS SPOT REMEDIAL CEMENTS WHERE WANTED

This useful tool aids remedial work off bottom of open hole or inside casing. Attached to Bailer section by special adapter, it is lowered to any depth in open hole or casing with a quick-setting material in the Bailer. A slight pickup of the Bailer sets and opens the Bridging Basket and dumps the material on top of the basket.

"DB" BRIDGING BASKET

HALLIBURTON HYDRO-LOK (PC-11)
PRODUCES A PERMANENT PLUG FOR EFFECTIVE SEAL

A plastic slurry consisting of a thermosetting resin and inert solids provides a squeeze material with fluid loss control. Hydro-Lok (PC-11) is either pumped by the Halliburton two-plug cementing method opposite the formation or placed by a Dump Bailer for various types of water control. Since water is an active catalyst for the resin, the setting of the resin when it is in place in a water formation is accelerated. PC-11 is adaptable for zones of high permeability, fractured sandstones and limestones... Low permeability formations can also be treated.

2 to 4 hours are required for a set in open hole. The resin phase which comes into contact with water in the formation sets in less than one hour and can be used in wells with temperature ranging from 60°F. to 240°F.

HYDRO-LOK (PC-11)

Dump Bailer Service

275 SERVICE CENTERS—JUST MINUTES AWAY FROM YOUR WELL

If distance is your problem

take a long look at *Lenkurt* carrier

ALL YOUR
COMMUNICATIONS NEEDS
FROM ONE
DEPENDABLE SOURCE

Lenkurt Type 32E Carrier Equipment is the most economical and efficient means of adding long-haul communications channels to existing wire lines.

By using single sideband suppressed carrier transmission and automatic pilot control, reliable communications under the most adverse weather conditions can be achieved over almost any distance.

Type 32E terminals are equipped with either 3 or 4 channels in the 3- to 35-kc range, and can be applied over v-f circuits. System levels and frequencies of the 3-channel equipment coordinate with those used in Western Electric Type C carrier units.

The AE-Lenkurt team of telephone engineers is equipped to handle as little or as much of the planning and installation as you wish. And AE will provide "follow-thru" service *for the life of the equipment.*

For full information on the Lenkurt Type 32E or companion equipment, call your Automatic Electric representative, or write the Director, Petroleum Sales, Automatic Electric Sales Corporation, Northlake, Illinois.

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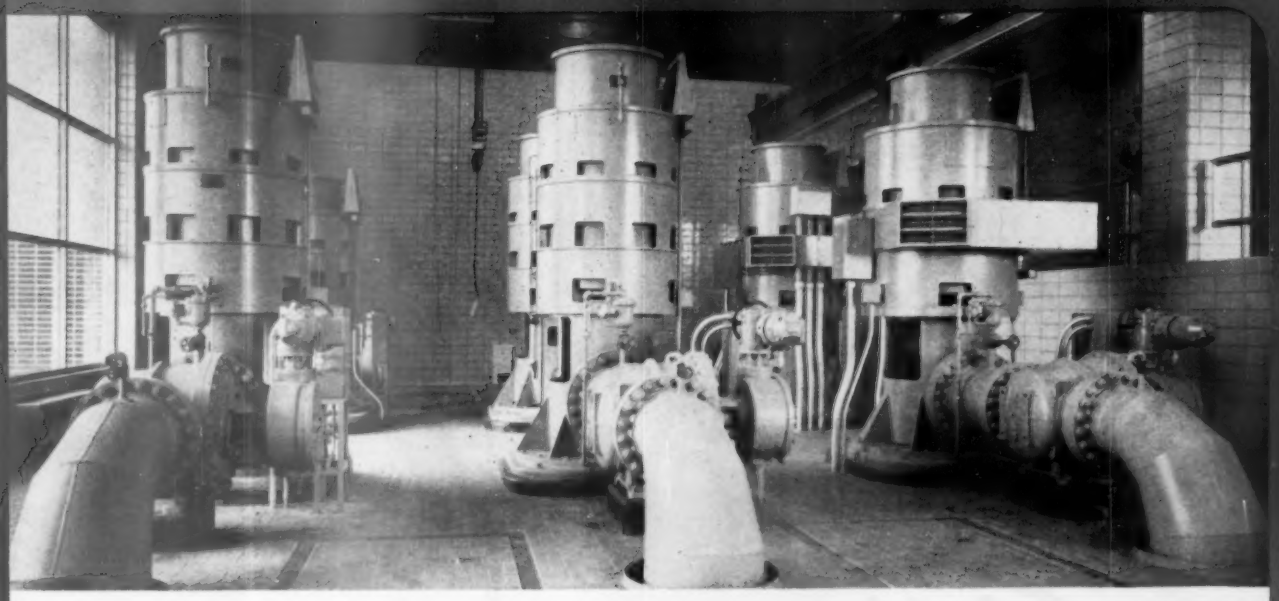
GENERAL TELEPHONE & ELECTRONICS

GENERAL SYSTEM



PLENTY OF WATER for Springfield-66 MILLION GPD Max.

Springfield, Ohio has a completely new, automatic water supply system by Layne. It guarantees 66 million gallons per day for their present and future needs—a job complete by Layne—and a completely satisfied customer. Field Tests exceeded the guaranteed pump efficiencies by 1% to 2% on all units. Consulting Engineers: Black and Veatch, Kansas City Missouri. Water Supply Contractors: The Layne Ohio Company, Columbus, Ohio. Do you need complete water service? Get it from Layne. Write for Bulletin 100.

Specifications

RAW WATER—10 Layne Gravel Wall Wells with Layne 18-8 Stainless Steel shutter screen and 10 Layne deep well pumps. 2800 GPM — 65 ft. TDH, 75 hp—440 Volts— 1750 RPM, located in two banks pumping to the filter beds. Pumps were installed 15 feet above ground level for flood protection.

FILTERED WATER—Six Layne high service pumps boosting filtered water into distribution system. Five are 12 MGD-285 ft. TDH, 700 hp—4160 volts—1185 RPM. Two are variable speed units. The sixth Layne Pump is a 6 MGD-285 ft. TDH, 400 hp—4160 volts —1185 RPM. All pumps operate through the central control panel.

LAYNE OFFERS COMPLETE WATER SERVICE: Initial Surveys • explorations • recommendations • site selection foundation and soil-sampling • well drilling • well casing and screen • pump design, manufacture and installation construction of water systems • maintenance and service • chemical treatment of water wells • water treatment—all backed by Layne Research. *Layne services do not replace, but coordinate with the services of consulting, plant and city engineers.*

City of Springfield, Ohio

Layne SINCE 1902 — WORLD'S LARGEST WATER DEVELOPERS

LAYNE & BOWLER, INC., MEMPHIS

GENERAL OFFICES AND FACTORY, MEMPHIS 8, TENN.

LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

Sales Representatives in Major Cities

Hydra Hook
W W
Pick the finest
ALL FROM ONE MANUFACTURER
BAASH-ROSS
BAASH ROSS TYPE
CONTACT YOUR
BAASH-ROSS REPRESENTATIVE
BAASH ROSS DIV
OUR 41ST YEAR OF PROGRESS
JOY
Baash-Ross and Web Wilson Tools are sold only thru supply stores
BAASH-ROSS
DIVISION OF JOY MANUFACTURING CO.
General Offices: Houston, Texas

In oil refineries,
chemical plant
and power undertakings
all over the world,
you will find
GKN Alloy Steel
Stud Bolts and Nuts,
and GKN Carbon Steel
Bolts and Nuts
for high-pressure,
high-temperature,
and moderate duty.
All these fastenings
are made, to the latest
British and American
specifications,
on some of the most
advanced machinery
in the world.
GKN quality
is consistently high;
GKN prices
are strictly competitive.

GKN Stud Bolts & Bolts

Studs, Bolts, Stud Bolts & Nuts for petroleum, chemical and power undertakings are made, under strict Quality Control, to the latest British and American specifications.

Guest Keen & Nettlefolds (Midlands) Ltd., Bolt & Nut Division, Atlas Works, Darlaston, England.

D/ST.B/715

CHECK the features of the...

Series 701 Screw End Check Valve Illustrated
Series SW701 Socket Weld End Valve also available

FORGED STEEL BOLTED BONNET

CHECK VALVES

150-800 POUNDS @ 850°F
2000 POUNDS COLD WORKING PRESSURE W.O.G.

1. These valves have Stellite* hard faced integral seats
2. 13% Chrome stainless piston checks
3. Stainless steel asbestos spiral wound body-bonnet gaskets
4. Forged steel bodies designed for light weight with maximum strength
5. Available in ¼" thru 2" sizes in both screw and socket weld ends

Write for Catalog F-10 to Dept. 24A-FO

HENRY VOGT MACHINE CO., BOX 1918, LOUISVILLE 1, KY.
SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J.
St. Louis, Charleston, W. Va., Cincinnati

Vogt

GENERAL GP PURPOSE

Vogt Forged Steel VALVES & FITTINGS

FORGED STEEL

VALVES

*Product of Union Carbide Corp.

You save drilling dollars with a Baroid Mud Program

THE MUD PROBLEM AND ITS SOLUTION

CARBONOX*

When the mud problem is to control drilling mud flow properties, CARBONOX is the answer. An organic mud thinner used for more than 12 years in all areas at all depths, CARBONOX is economical, simple to use and reliable in results.

In a typical case history where CARBONOX was part of an over-all Baroid mud program, CARBONOX proved to be the best thinner for controlling high temperature gelation and viscosity and aided in controlling filtration and filter cake thickness. This was on a 16,684 foot well in San Salvador Field, Hidalgo County, Texas. Bottom hole temperature was 356°F, mud weight was up to 19.1 lb/gal, and other adverse conditions included salt contamination and lost circulation. Yet CARBONOX helped keep the lime-treated oil emulsion mud in desired condition.

CARBONOX is a Baroid original, developed to control mud flow properties economically. Baroid develops complete mud programs to solve your specific drilling mud problems and save *your* drilling dollars.

MAINTAINS GOOD EMULSIONS

THINS MUD WITHOUT DILUTION

KEEPS MUD STABLE AT HIGH TEMPERATURE

RESISTS EFFECTS OF SALT WATER

BAROID

BAROID DIVISION NATIONAL LEAD COMPANY

MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS

*Registered trademark of Baroid Division National Lead Company

6029

Lights, camera, action

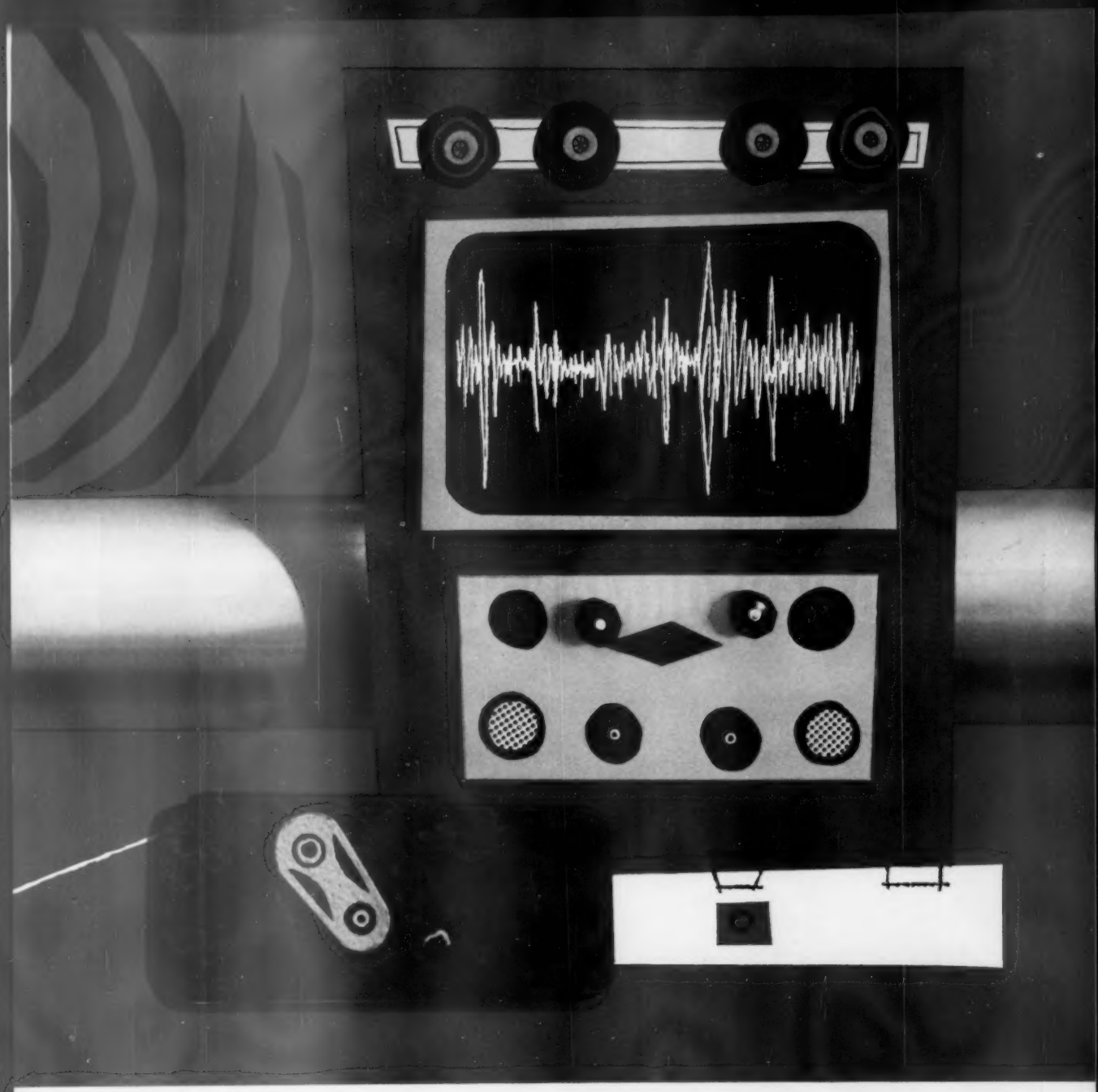
National Tube tests USS National Electric-Resistance Welded Pressure Tubing with sound waves. This ultrasonic weld inspection process is tougher than a Hollywood screen test.

This mark tells you a product is made of modern Steel.

As the tubing slides directly over a ground quartz crystal, electrical pulses are focused on the weld area. The crystal changes these pulses into ultrasonic vibrations which bounce off the weld and reflect its strength or weakness. The vibrations are speared by the crystal, converted back into electrical energy, and floated across an oscilloscope screen.

If a bad weld is reflected, the electrical current dances wildly on the screen and triggers an alarm system. The crooked pattern is pen-recorded on a graph, a bullfrog-voiced horn croaks loudly, and the tubing is squirted with black paint to mark the defect.

In case the ultrasonic unit breaks down, a red-faced dome



light automatically flashes, revolves and winks at the weld inspector. This blushing signal tells him that the unit needs to be repaired. It's added insurance that every length of tubing is completely tested before it leaves the plant.

Our inspection techniques are rigid. But they help us develop a high quality product for use in applications such as boilers, heat exchangers, condensers, superheaters, economizers and other types of heat transfer equipment. Consider USS National Electric-Welded Tubing for your next installation. Our trained Mill Service Force is available for field consultation. Write National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. *USS and National are registered trademarks*

National Tube Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York
United States Steel Supply Division

SOLID CONFIDENCE

BUILT ON

SOLID PERFORMANCE

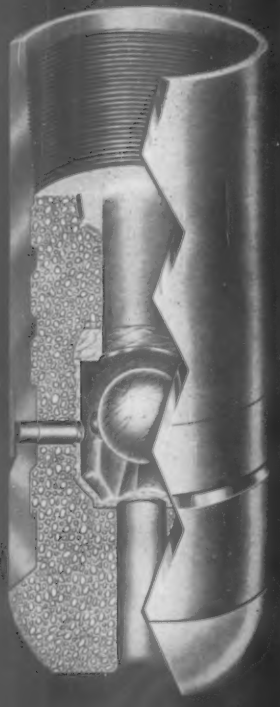
YEAR

AFTER

YEAR

AFTER

YEAR



A complete, dependable line of primary cementing equipment available to you . . . "Through Your Supply Store".

LARKIN PACKER COMPANY

DIVISION KOEHRING COMPANY

WAXAHACHIE, TEXAS

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

LARKIN

...Through Your Supply Store

Mr. John W. Kelley (seated) President of Columbia Gulf Transmission Co., Houston, and Mr. S. Orlofsky, Vice President, examine model of Clark TPV gas engine now installed in their Hampshire, Tennessee compressor station.

ANOTHER DRESSER BREAKTHROUGH

WORLD'S MOST POWERFUL GAS ENGINE FOR PIPELINE SERVICE BUILT BY CLARK!

The Nation's ever-growing need for natural gas means that the present gas network will be increased from 596,000 to 878,000 miles within ten years. By creating the powerful TPV gas engine, Clark Bros. Co., one of the Dresser Industries, is helping pipeline companies to deliver gas at minimum cost to consumers.

Combining two-cycle simplicity and dependability with V-type compactness and efficiency, the new Clark TPV engine provides savings in installation, housing and operating costs. It is another dramatic innovation made possible by the vast knowledge and experience of Clark engineers whose "precision by the ton" products include heavy-duty gas turbines and compressors as well as engines.

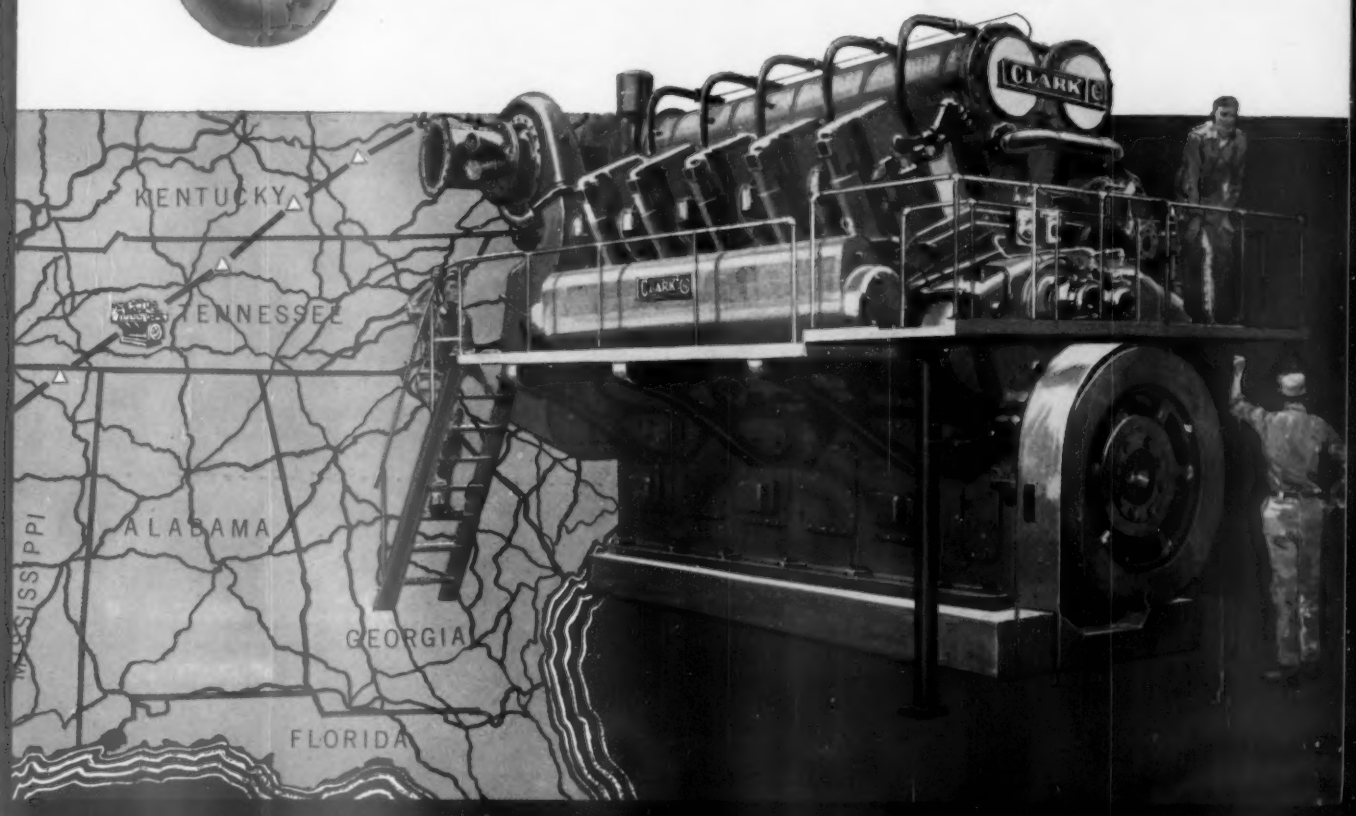
At Clark Bros. Co., Olean, New York, as with all Dresser operating companies, new products are continually being researched, developed, tested and introduced. Individually, in combination, or as a complete group, Dresser companies are prepared to put their specialized yet diversified skills and worldwide facilities to work for you.

DRESSER INDUSTRIES, INC.

Tomorrow's Progress
Planned Today
By Men With Imagination

REPUBLIC NATIONAL BANK BUILDING, DALLAS 21, TEXAS

EQUIPMENT AND TECHNICAL SERVICES FOR THE OIL, GAS, CHEMICAL, ELECTRONIC AND OTHER INDUSTRIES



The hard-boiled coating that couldn't be cracked

". . . boiled in water for one year without film failure or softening", excerpt from Glidden lab report on a special new coating system.

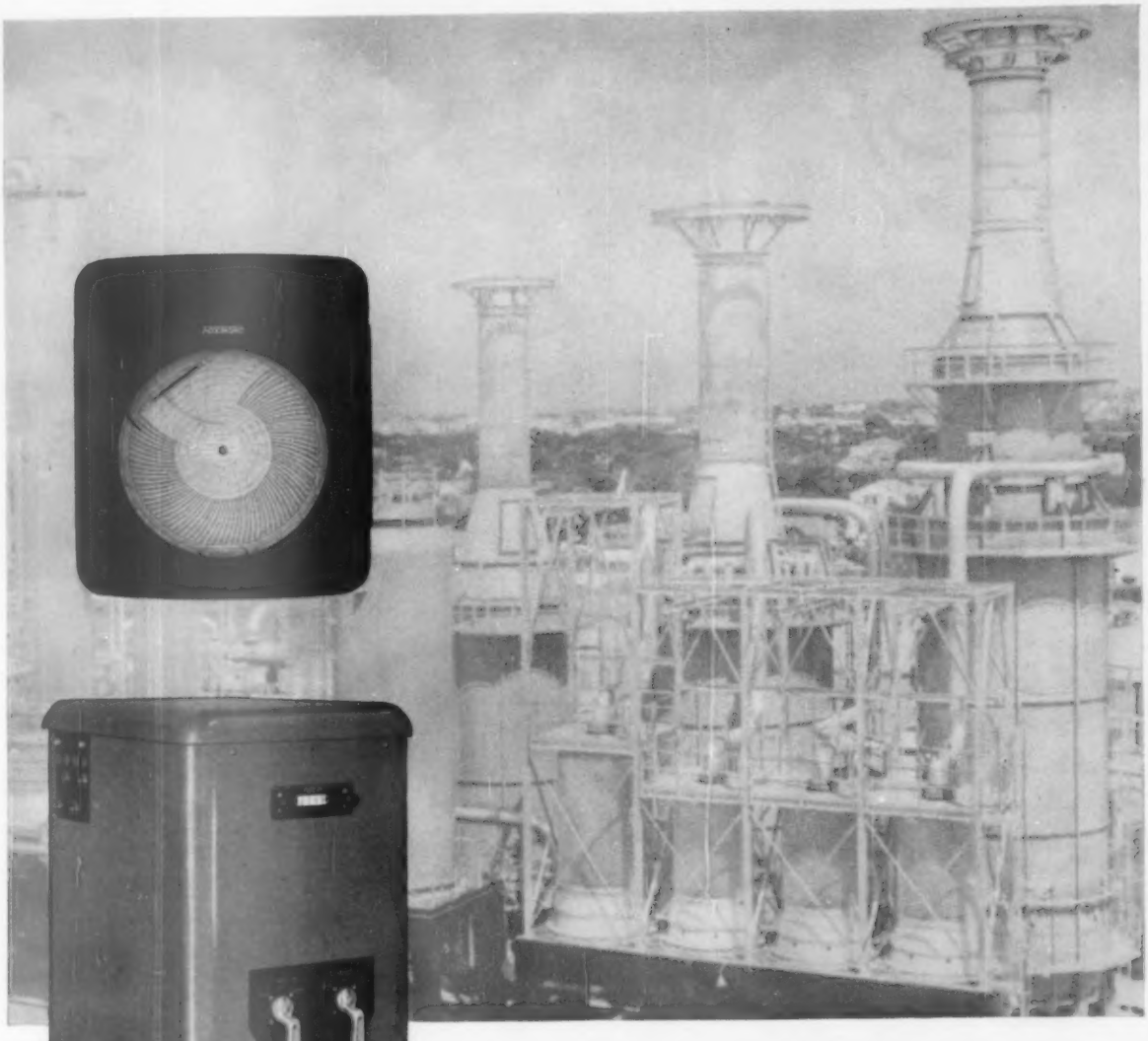
Tortures such as this are common in the Glidden laboratories where maintenance coatings are tested and proven. With good reason, too, because these coatings must stake their reputations on high performance standards.

Laboratory and field-proven Glidden Protective Maintenance Coatings are on the job wherever chemical, railroad, petroleum, marine and industrial equipment must perform under highly corrosive conditions.

QUALITY Glidden PRODUCTS

COATINGS FOR EVERY PURPOSE
The Glidden Company
INDUSTRIAL PAINT DIVISION
900 Union Commerce Building • Cleveland 14, Ohio
In Canada: The Glidden Company, Ltd., Toronto, Ontario

Write for your free copy of booklet containing complete information on all Glidden Protective Maintenance Coatings.



Top: Foxboro Capacitance Dynalog Electronic Recorder

Below: Foxboro Octane Improvement Analyzer

The Foxboro Octane Improvement Analyzer is based on a development of the Humble Oil & Refining Company. The Foxboro Company is licensed to manufacture the analyzer under patent rights held by Esso Research and Engineering Company.

this new Foxboro system lets you measure octane improvement... continuously, automatically

Now you can have a continuous, accurate, automatic reading of octane improvement on any catalytic reformer equipped with the new Foxboro Octane Improvement Analyzer.

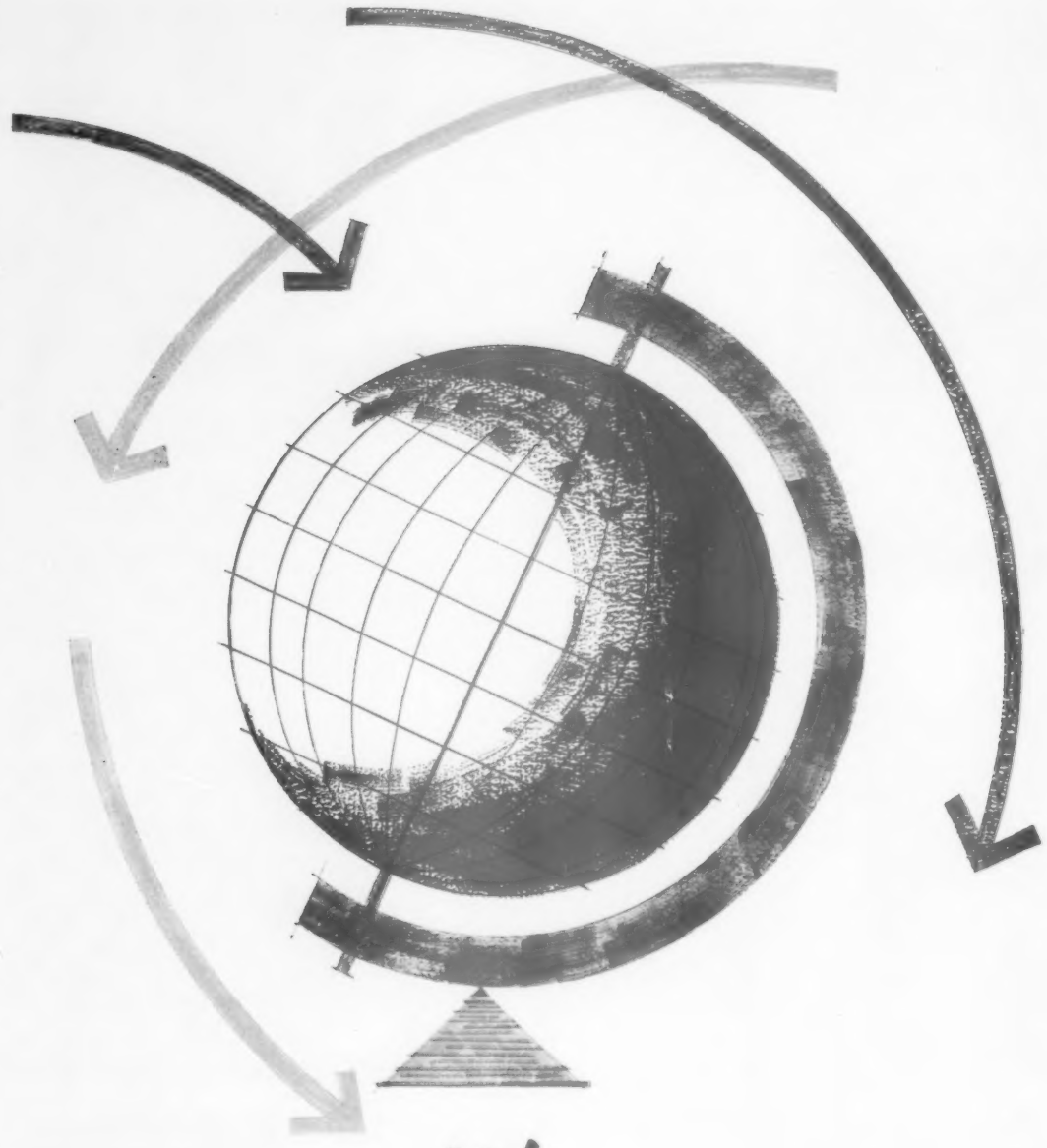
Here's how it works. The field-located Analyzer alternately monitors the dielectric constant of the feed stream to—and the product stream from—a catalytic reformer. Both measurements are recorded directly on a Foxboro Capacitance Dynalog* Recorder. And, since a direct correlation exists between dielectric constant difference and octane improvement, the Dynalog chart provides a continuous record of octane improvement.

The Foxboro Octane Improvement Analyzer pays for itself in as little as six months by providing data for faster recovery from reformer upsets. It also substantially reduces the number of knock-engine analyses required. Ask your Foxboro Field Engineer about this unique refining aid. Or write for Technical Information 27-111a. It has all the details. The Foxboro Company, 607 Neponset Ave., Foxboro, Massachusetts.

Reg. U. S. Pat. Off.

FOXBORO

REG. U.S. PAT. OFF.



Wherever you orbit

ATLAS WILL DELIVER AND SERVICE TUBULAR GOODS

A DIVISION OF ATLAS BRADFORD COMPANY

ATLAS PIPE INC.

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DISTRIBUTOR FOR

REPUBLIC STEEL CORPORATION

7 Reasons Why:

the HUSTLER cuts your operating costs!

1. Specially designed carrier
2. More usable wheelbase
3. Dependable industrial engine
4. Rugged outboard-mounted clutch
5. Powerful oversize brakes
6. Fully-enclosed oil-bath chain drives
7. Lower maintenance cost

The Cardwell Hustler is one of the fastest units available today — from the standpoint of roading, rig up AND over-the-hole efficiency!

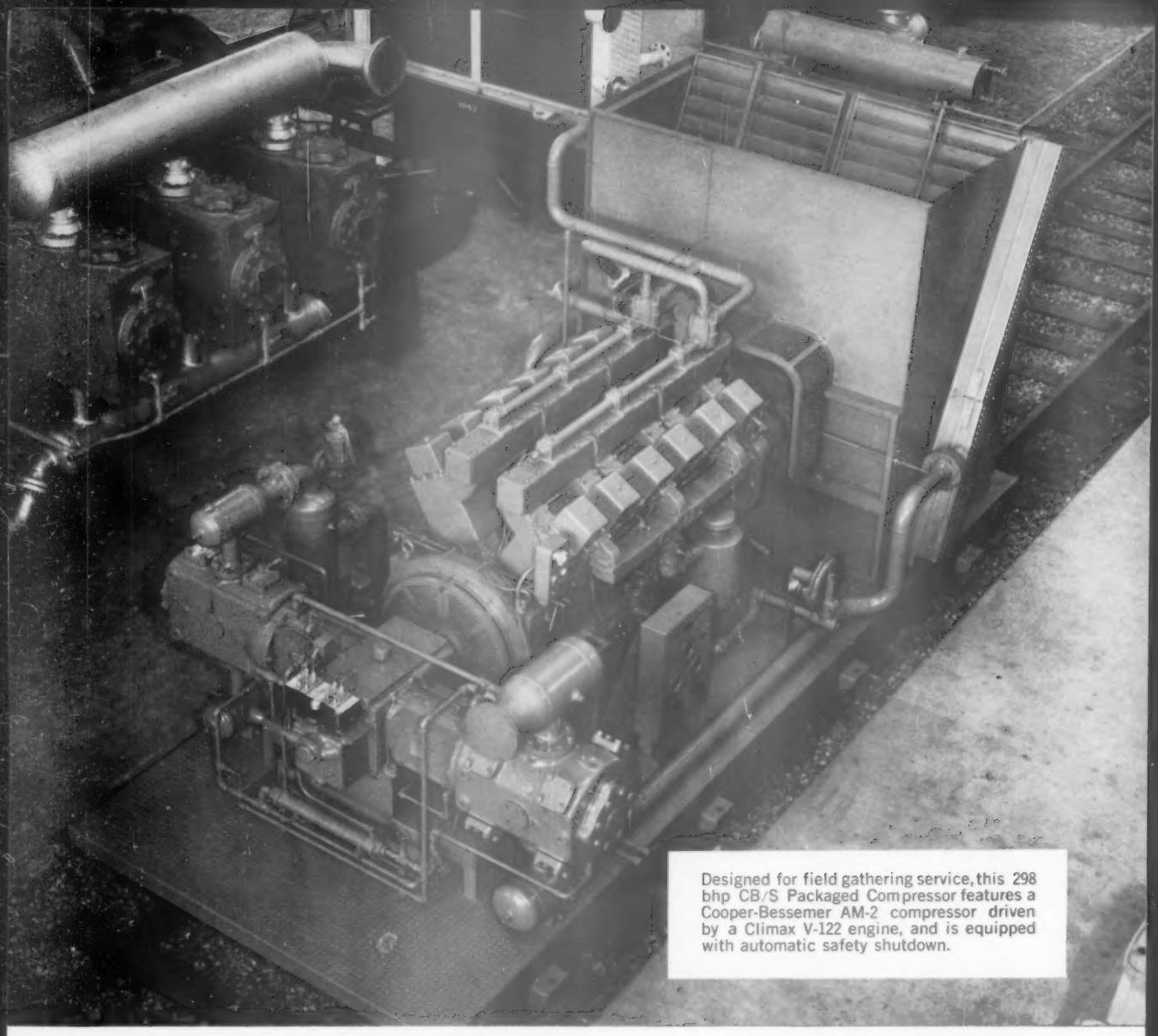
Designed for competitive servicing and workover in the 6,000 to 10,000 foot range*, the Hustler has **full** capacity to economically **and competitively** handle all requirements in its range — and make a better profit for you. It incorporates ALL the features that minimize wear, maintenace, and operating costs.

Before you buy any servicing unit, it will pay you to investigate — at close range — the reasons we say: "The Cardwell Hustler cuts your servicing costs."

* pulling 2½-inch tubing

cardwell *manufacturing company, inc.*

Box 2001, Wichita, Kansas • Cable: ALLSTEEL • Phone AMherst 7-3311



Designed for field gathering service, this 298 bhp CB/S Packaged Compressor features a Cooper-Bessemer AM-2 compressor driven by a Climax V-122 engine, and is equipped with automatic safety shutdown.

Building packaged compressors is our business . . . our only business. This single objective is the reason CB/S Packaged Compressors are more advanced in design . . . more efficient in the field.

CB/S
PACKAGED
COMPRESSORS

CB/S

C-B SOUTHERN, INC., P. O. BOX 19267, HOUSTON 24, TEXAS

A subsidiary of The Cooper-Bessemer Corporation.

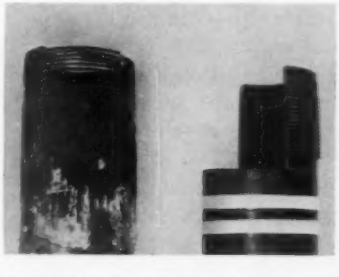
Fibercast flow line suspended by cable 900 feet from well to tank battery. Typical application of Fibercast because of its light weight, superior beam strength and resistance to elements.

Fibercast® performs better in oil country than any other non-metallic pipe

The reinforced epoxy resin construction of Fibercast Tubing and Line Pipe enables it to indefinitely withstand high pressures, high temperatures, and extreme corrosive conditions.

Fibercast is *proven* pipe, too. Few industries make more stringent demands upon pipe and tubing than the oil industry. Yet Fibercast's record proves that it more than adequately meets these demands in installation after installation. It has an operating temperature range wider than any other non-metallic pipe (-65° to 300° F.) Its operating pressure range extends to 1200 psi. But best of all, serious corrosion problems are almost completely eliminated with Fibercast.

Because it is not subject to cold flow or permanent set, Fibercast is remarkably easy to install. It readily follows ditch contours, saving costly manhours where other non-metallic or coated metal pipes simply are not suitable. Moreover, Fibercast's operating collapse strength, an important factor in installation design, is capable (based on long-term testing) of sustaining a collapse load of *twice* the rated collapse.



Fibercast Tubing (right) used to suspend a 1,200 lb. pump for 3 years in a salt water supply well. *There was no loss in strength.* The damaged plastic-coated steel nipple (left), was used in the same installation, failed after 3 months' service.

Its linear coefficient of thermal expansion (7.06×10^{-6} to 8.25×10^{-6}. in. /in. / °F.) is essentially the same as that of steel. But Fibercast is much lighter than steel, (less than ¼ its weight), and is correspondingly easier to work with. Yet, because of its strength, Fibercast can even be installed on pipe racks with span lengths normally used for metal pipe.

Fibercast has been tested in 338 common corrosive solutions and competently handled 320! Actual installations in the oil fields have revealed Fibercast's effectiveness against corrosion, contamination, abrasion, scaling and paraffining. Used as a flow line . . . in a salt water disposal well . . . or as shot hole casing, Fibercast performs better, lasts longer, costs less.

Fibercast Fittings are a "must" in oil country, too. Besides the ready availability of the world's most complete stock of standard sizes and types, you can have couplings designed and made to order for individual requirements.

If *you* would like to learn more about controlling corrosion through the use of Fibercast, mail the coupon below.

FIBERCAST COMPANY
Box 727, Sand Springs, Okla.

Please send me further information about Fibercast Tube and Pipe.
OGJ-7A

Name _____

Title _____

Firm _____

Type of Business _____

Address _____

City _____ Zone _____ State _____

FIBERCAST COMPANY

A DIVISION OF Youngstown SHEET AND TUBE COMPANY

Here's Why Oil Men Specify—

EC&M
HIGH VOLTAGE STARTERS

2200-4800 VOLTS
FOR
PRESSURIZED ROOMS
OUTDOORS
INDOORS

left • Type AH Starter (50,000 KVA, certified) for Division 2 Applications. NEMA 3R (raintight) Enclosures for mounting outdoors
below • Diesel loading pump station in southwestern refinery

EC&M Starters are standardized for *easy selection.* They are *easier to install* because they are shipped with all internal wiring complete. They are designed for *easier, faster inspection and maintenance.* And—they *save valuable space* because they are compact with no sacrifice in accessibility.

EC&M's Type AH Starters are available in NEMA 1 or 3R (raintight) enclosures for outdoors, indoors or pressurized control rooms. Three interrupting ratings: 50,000 KVA—POWER FUSED—and VALIMITOR®

Write for Bulletin 8130.

Five EC&M Aligning Starters with Incoming Line and Feeder Panels for Pumps and Compressors (Pacific Coast Refinery)

Pressurized Control Room with ten NEMA 1 EC&M Enclosed Starters in midwest refinery

SQUARE D COMPANY
EC&M DIVISION • CLEVELAND 28, OHIO

wherever electricity is distributed and controlled

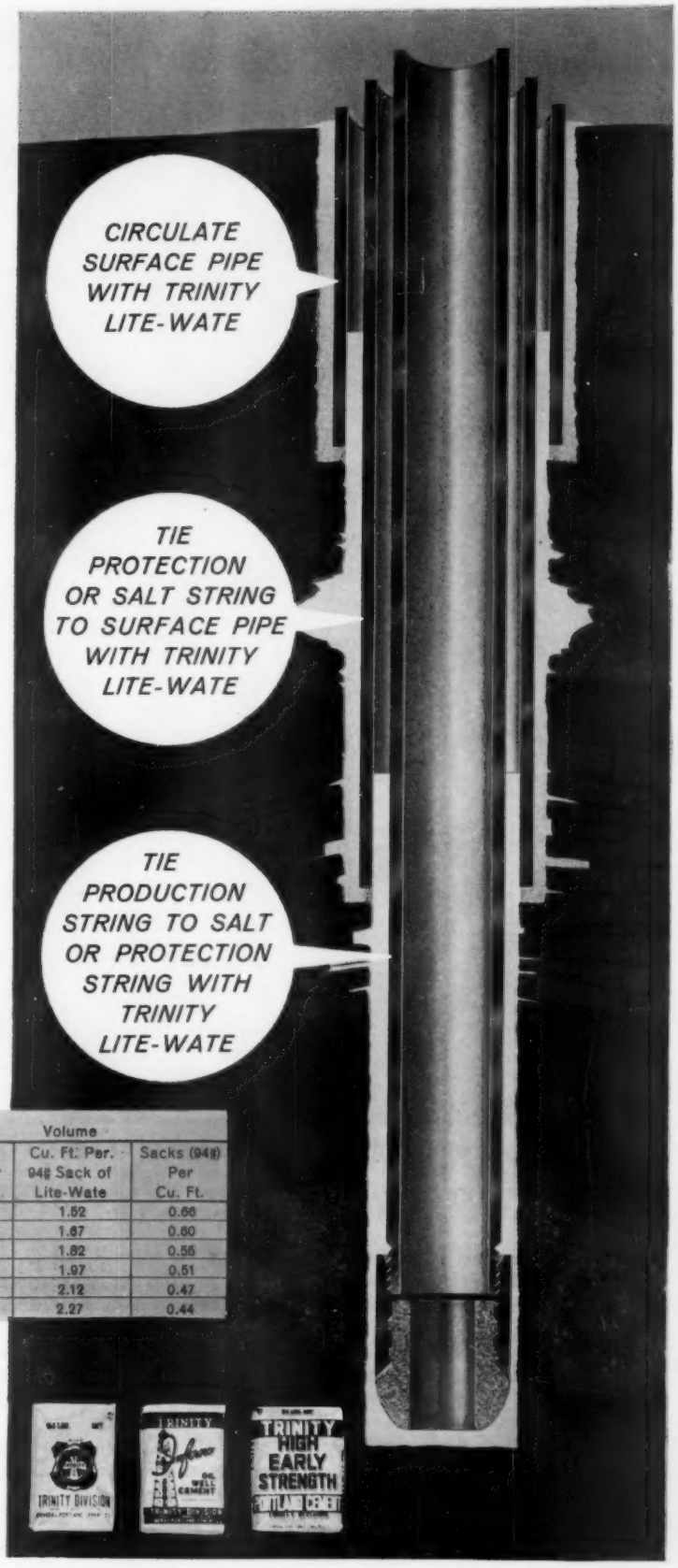
8019

Trinity
LITE-WATE
A Complete
LOW-DENSITY CEMENT

No loss to weak formations

Trinity Lite-Wate is a neat oil well cement with a low slurry density. Nothing to add but water. It derives its light weight properties entirely from the high quality raw materials from which it is made. Easy mixing, easy pumping, can be circulated with low pump pressure and without loss to weak formations. It has proved satisfactory in circulating the surface pipe, tying protection or salt string to surface pipe and tying production string to protection or salt string.

Trinity Lite-Wate has been in use for several months in such varying well conditions as found in West Texas, Oklahoma, East Texas, Louisiana, Gulf Offshore and New Mexico, it has produced returns in *every case* where attempted.


CIRCULATE SURFACE PIPE WITH TRINITY LITE-WATE
TIE PROTECTION OR SALT STRING TO SURFACE PIPE WITH TRINITY LITE-WATE
TIE PRODUCTION STRING TO SALT OR PROTECTION STRING WITH TRINITY LITE-WATE
TRINITY
TRINITY DIVISION
TRINITY
OIL WELL CEMENT
TRINITY HIGH EARLY STRENGTH

SLURRY PROPERTIES

All slurries were mixed in accordance with procedures in API RP 10B. Slurry weight and volume were calculated on the basis of Lite-Wate specific gravity of 2.80.

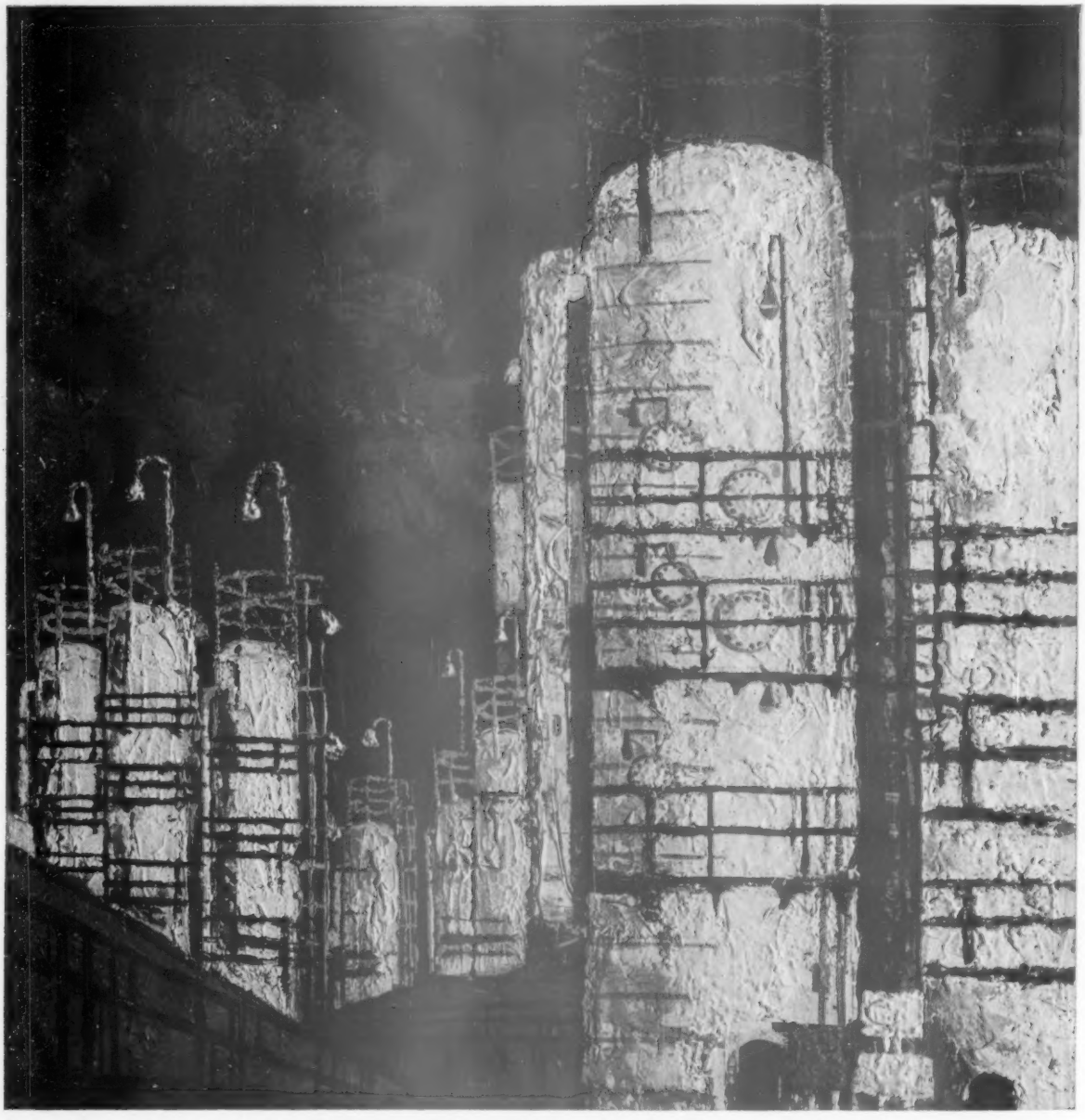
Mixing Water			Volume		
Per cent	Gallons Per 94# Sack of Lite-Wate	Initial Viscosity Poises	Slurry Wt. Pounds per Gallon	Cu. Ft. Per. 94# Sack of Lite-Wate	Sacks (94#) Per Cu. Ft.
69	7.33	13	13.66	1.52	0.66
75	8.46	6	13.18	1.67	0.60
85	9.58	4	12.77	1.82	0.55
95	10.72	3	12.44	1.97	0.51
105	11.84	2	12.14	2.12	0.47
115	12.97	1	11.89	2.27	0.44

TRINITY

PORTLAND CEMENT DIVISION
GENERAL PORTLAND CEMENT COMPANY

GPCC

DALLAS·FT.WORTH·HOUSTON



More drying per dollar in nine towers showed Columbia Gulf Transmission why it pays to

mix imagination with Alcoa Aluminas

Nearly ½-million lbs of Alcoa® Activated Alumina is giving Columbia Gulf Transmission Co. maximum drying capacity per dollar in one of the world's largest natural gas drying operations. Used in nine towers at the company's Rayne, Louisiana, compressor station, the activated alumina dries 690 MMSCF of natural gas per day. Average water content of gas entering the towers is 5-6 lbs water/MMSCF. Water content of the effluent gas is below ½ lb water/MMSCF. Each tower is on stream for 24 hours with a reactivation time of 6 hours. Columbia Gulf Transmission has found that no other desiccant can furnish such efficient drying at such low cost.

When effective, economical drying is your aim, it pays to mix imagination with Alcoa Activated Aluminas—the oldest commercial desiccant available and still the most efficient. For detailed data, send for a free copy of the Alcoa White Data Sheets and a comprehensive Gas and Liquid Dehydration Questionnaire. Aluminum Company of America, Chemicals Division, 709-G Alcoa Building, Pittsburgh 19, Pa.

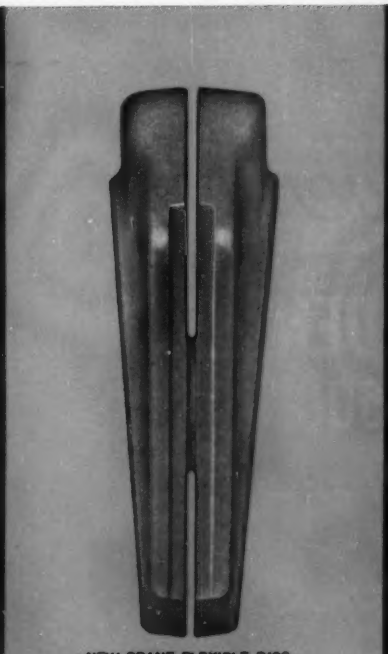
ALCOA CHEMICALS
ALUMINUM COMPANY OF AMERICA

For finer products . . . let Alcoa add new dimension to your creative thinking!

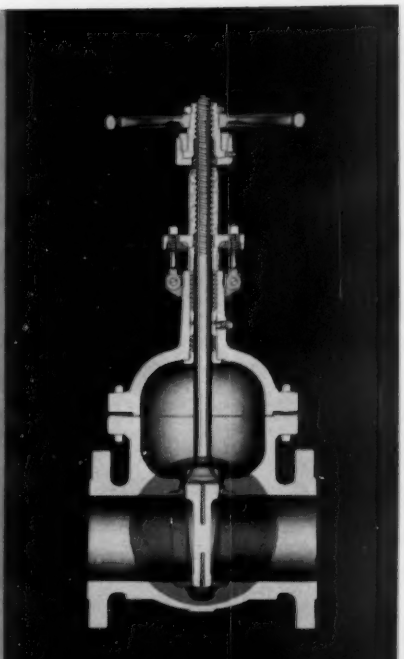
Reporting more news from...

CRANE DIRECTION '70

. . . a fast-moving program of planned expansion, product development, and streamlined distribution to help our customers meet the challenge of the Soaring Sixties.



NEW CRANE FLEXIBLE DISC



The most significant advance in gate valve design in 25 years...

CRANE FLEX GATES®

Instead of being made with a solid disc, new, patented Crane Flex Gates have separate disc faces, connected by the axle-like unit shown in the cross section. This joins the two seating faces, yet provides flexibility for the faces to seat tightly with independent action.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates seat with less torque.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates unseat with less torque . . . will not stick closed even when closed while hot and allowed to cool.

BECAUSE THEY'RE FLEXIBLE, minor deflection of seating faces due to pipe strains does not affect tightness of Crane Flex Gates.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates are tight on inlet seat and outlet seat over a wide range of pressures.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates can be used singly in some services where two conventional gate valves are frequently specified. You can save substantially on piping costs.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates can be serviced—body seat rings replaced or seating faces refinished—quickly, and without painstaking accuracy. Slightly off-taper seats do not affect tightness or operating ease.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates will easily outperform any conventional solid wedge disc valve you now use. *And there's no increase in price.*

BECAUSE THEY'RE MADE BY CRANE, these new Flex Gates are completely dependable. You can use them with complete confidence on steam, water, gas, oil or oil vapor service. Stem and disc seating faces are Crane Exelloy. Shoulder-type body seat rings are Exelloy or Crane No. 49 Nickel Alloy. Sizes: 12 inch and smaller; 150- and 300-pound pressure classes.

Ask your Crane Distributor for full information on Flex Gates—and for data whenever you work with the products Crane makes. He has the newest in information and products. Crane Co., Industrial Products Group, 4100 South Kedzie Avenue, Chicago 32, Illinois.

CRANE®

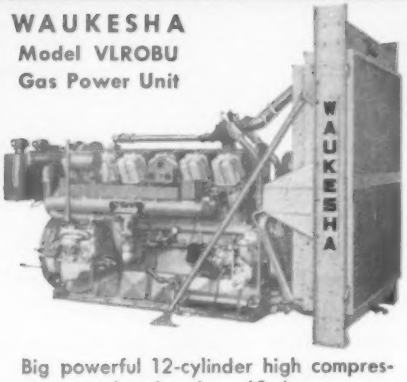
VALVES • ELECTRONIC CONTROLS • PIPING • PLUMBING • HEATING • AIR CONDITIONING

three WAUKESHAS power

B. L. McFarland Drilling Co., of Midland, Texas, first to drill with new "1500" Gardner-Denver rig.

With its drawworks rated 1500 input hp, this new Gardner-Denver "1500" rig is fast, economical and efficient for drilling to 20,000-ft. with 4½-in. O.D. drill pipe. A total of 8 forward and 2 reverse speeds to the drum; 4 forward and 2 reverse speeds to the rotary table can be obtained. Compounds and drive arrangements for this drawworks are limited only by customer requirements. The McFarland rig shown includes a 142-ft. 1-million lb. capacity drilling mast, one Gardner-Denver RT-27½ rotary table, and two Gardner-Denver GR-GXR mud pumps. Powering the rig are three Waukesha Model VLROBU Waukesha Gas Power Units with tremendously powerful, rugged 12-cylinder 5788 cu. in. engines, each developing 700 continuous duty hp, well known for their long-life dependability and economy in oil field service.

WAUKESHA
Model VLROBU
Gas Power Unit



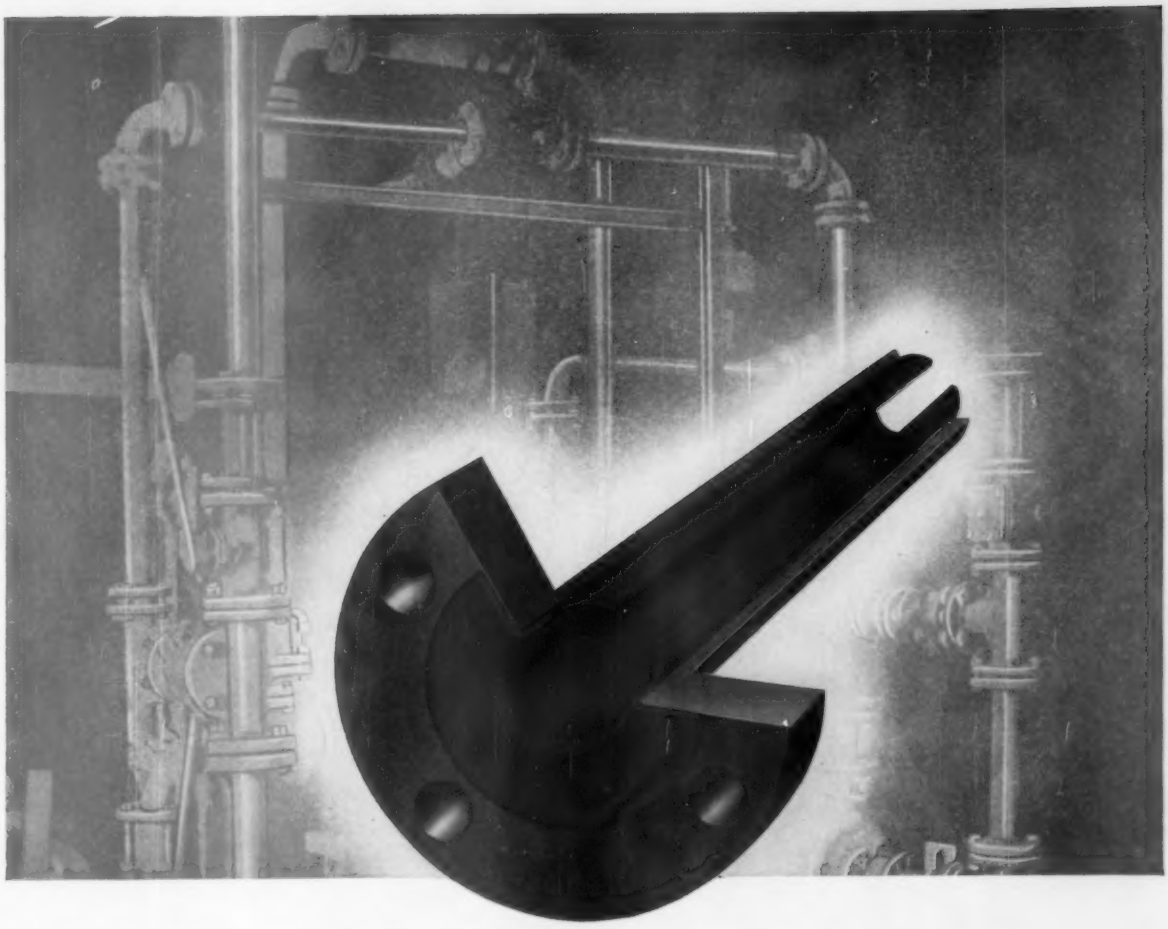
Big powerful 12-cylinder high compression, overhead valve, 60-degree vee, four-cycle engine of 8½-in. bore and stroke, 5788 cu. in. displacement. Connecting rods are paired; opposing pistons operating from a single wide area 5¾-in. dia. crankpin; 7-bearing 6¼-in. dia. crankshaft. Send for Bulletin 1656.

Waukesha Engines and Power Units to 1235 hp. Turbocharged and Normal Diesels, Natural Gas, LPG. Get Bulletin 1079.

SEE OUR CATALOG IN COMPOSITE CATALOG

491

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN / **New York • Tulsa • Los Angeles**
Factories: Waukesha, Wisconsin and Clinton, Iowa



Plant saves $60,000 per month by switch to pipe lined with TEFLON®

In a plant manufacturing a chemical intermediate, excessive maintenance costs and product losses ran as high as $60,000 per month. Such frequent failures occurred in the process involving corrosives at high temperatures and pressures, that onstream time averaged only 75% during the first six months of operation. After a period of testing, more than 1500 feet of pipe lined with Du Pont TEFLON TFE-fluorocarbon resin were installed. Result: No failures of lined pipe occurred in over 2 years of service.

TEFLON TFE resins are unaffected by HCl liquid and vapors, fuming nitric acid—white or red—hydrofluoric acid, organic solvents and reagents. TFE resins are rated for use up to 500°F. Their non-adhesive surfaces prevent plugging by high-viscosity materials. TFE resins do not shatter under vibration, thermal or physical shock.

The liner flared over the flanges provides protection for the steel from the process fluid and eliminates the need for additional gasketing. Installation costs are further reduced because the pipe is equipped with standard flanged fittings which are easily connected. And the need for careful aligning, hanging, welding and other special procedures is eliminated.

In your petrochemical processes, you can insure long service life and greatly reduced maintenance and downtime by installing pipe lined with TEFLON TFE resins. For more details on properties and performance send for the new bulletin on Lined Pipe . . . and for more general information, ask for the fact-filled booklet, "Designing with TEFLON". Write to: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department T-30-7, Room 2526, Nemours Building, Wilmington 98, Del. **In Canada:** Du Pont of Canada Limited, P. O. Box 660, Montreal, Quebec.

DU PONT REG. U.S. PAT. OFF. **TEFLON®** FLUOROCARBON RESINS

TEFLON is Du Pont's registered trademark for its family of fluorocarbon resins, including TFE (tetrafluoroethylene) resins and FEP (fluorinated ethylene propylene) resin.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

REPLACE STILL CONVECTION BANKS

WITH A **LJUNGSTROM® AIR PREHEATER**

You can make major economies in the refining of corrosive crudes, or in any refining that involves very high temperatures, by replacing still convection banks with a Ljungstrom Air Preheater. This is how.

The radiant section of your still, operating with an Air Preheater, can deliver as much throughput (and possibly more) as was formerly possible using convection banks. And with an Air Preheater the oil tubes get the maximum amount of heat without the expensive heat- and corrosion-resistant alloys sometimes required for convection banks.

In addition, an Air Preheater provides other economies that you just don't get with convection banks. For example, an Air Preheater can cut fuel costs by 20%. It will promote high equipment availability by drastically cutting formation of slag and deposits. And an Air Preheater can take full advantage of the most modern fuel-burning equipment to give you much closer control of temperature—close enough to boost average product ratings as much as two octane numbers.

These extra savings can be almost pure profit, because you will probably save enough by eliminating or reducing convection banks to pay the cost of an Air Preheater installation.

Here's documented evidence. One company's fuel savings with a Ljungstrom Air Preheater are factually described in a published magazine article by O. F. Campbell. A reprint of this case history is yours free. Simply write to Air Preheater Corp.

THE AIR PREHEATER CORPORATION

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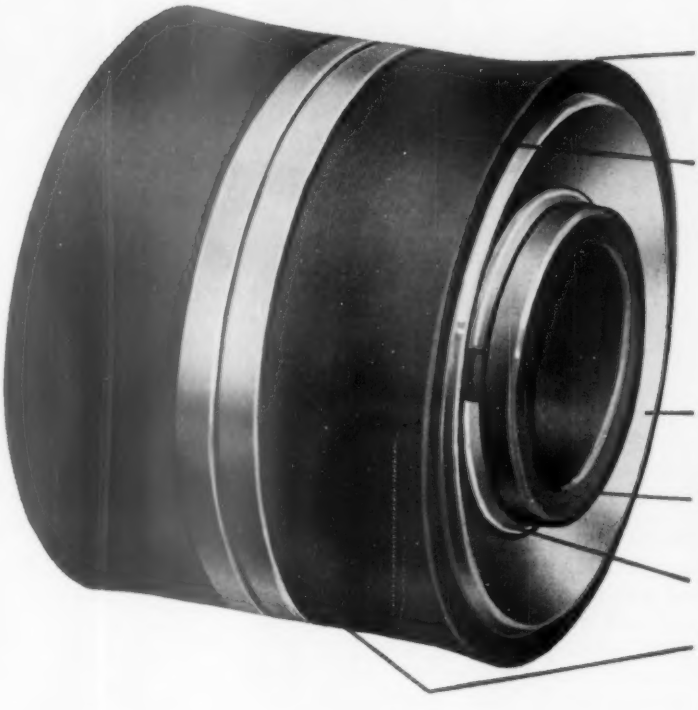
GUIBERSON'S

OIL FIELD TOUGH PUMP PISTON



RUBBER LIP
. . flexible, tear resistant, provides maximum pump efficiency under high or low fluid pressures.

FORMULA-59 RUBBER COMPOUND
. . the secret of a longer pumping life. Developed in Guiberson laboratories, this unique rubber compound is a typical Guiberson solution of a tough oil field problem. Rugged, oil resistant, this rubber is exceptional in its resistance to tearing and for its long life in pumping abrasive drilling muds.

RETAINER PLATE
. . rounded edge, cannot cut rubber, often the cause of premature failures.

HUB
. . precision machined alloy steel forging, fits popular API tapers.

SNAP RING
. . quick and easy to install.

HEAVY FABRIC BACKING
. . greater support for high pressures and heavy muds . . firmly bonded to rubber.

pays off in around-the-clock reliable service

Whether using high pressures or low . . under abrasive or non-abrasive conditions, Guiberson pistons are *record breakers* for longer pumping between rubber changes. Compare them yourself in your own pumps. They are competitively priced, so you gain by longer runs.

Guiberson Pump Pistons Are Sold by Oil Field Supply Stores Everywhere

THE GUIBERSON CORPORATION

ESTABLISHED 1919 — DALLAS, TEXAS U. S. A.

ARMOUR FUEL OIL ADDITIVES –

How they protect against sludge from refinery to furnace

Armolad® additives, Armour's furnace-oil stabilizers, are gaining wide acceptance as highly economical and effective sludge inhibitors. Using Armolads, refiners can stop worrying about additives that lose effectiveness while in transit or storage.

Fuel oil additives are subject to various conditions which can reduce their sludge-inhibiting properties. Major causes are: incompatibility with other additives, reaction with fuel contaminants themselves, and the presence of water—particularly in barges and storage tanks—which causes "leaching." Maintaining the effectiveness of the additive can only be achieved by increasing the concentration, which in turn raises costs unnecessarily.

Refiners using Armolads have found they are extremely resistant to water extraction, compatible with most other additives, help eliminate hazing, and will not react with fuel contaminants.

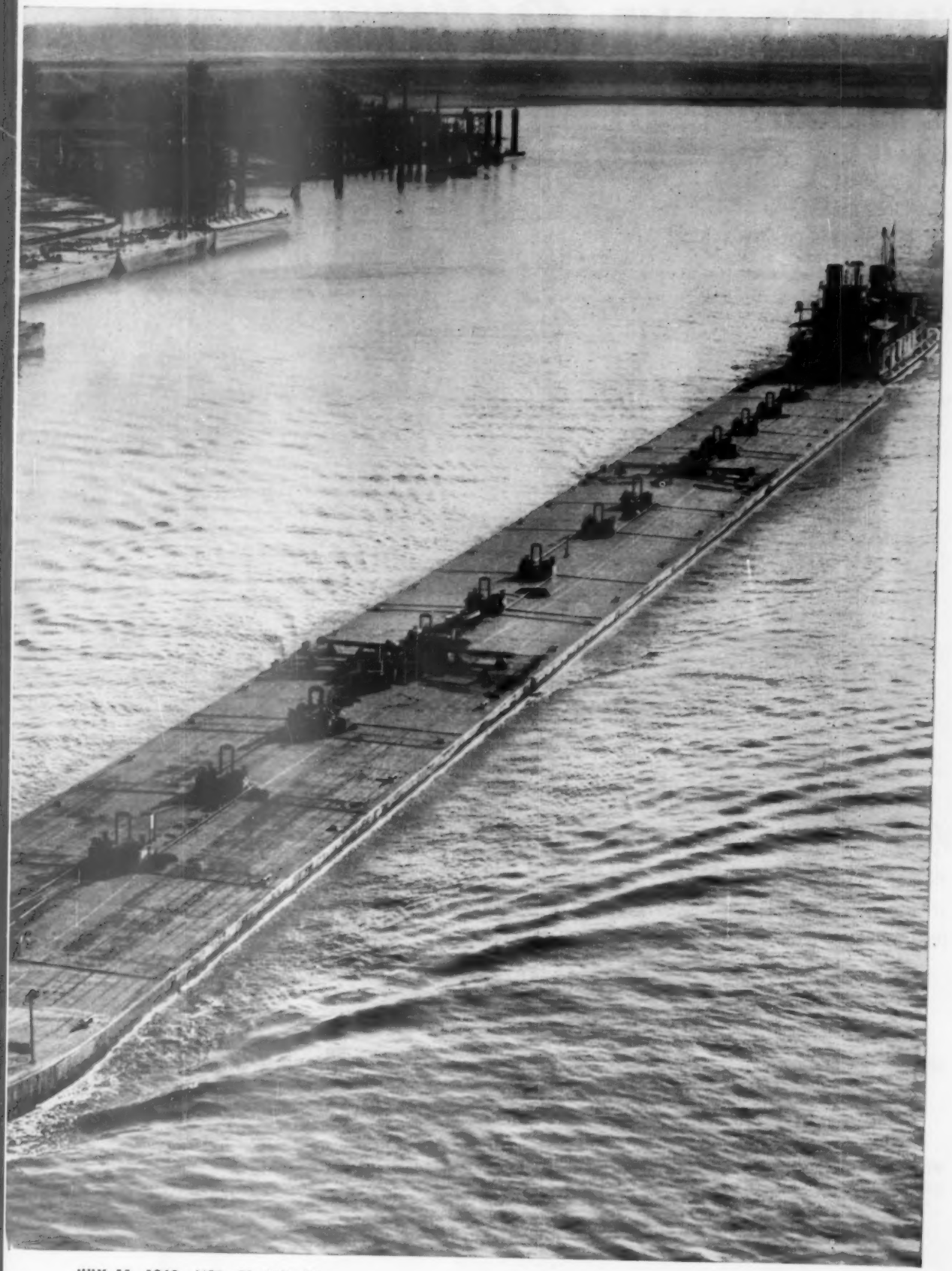
In addition, when fuel oil containing Armolads is pumped through the lines, monomolecular adsorption places a thin coating of the additive on the surfaces. This film offers resistance to corrosive action.

Armolads are available in several different formulations. Each has been found to suit the special needs of specific crude stocks. Additional information on these additives and their use is available by writing for the new booklet "Armolads."

Armour Industrial Chemical Company

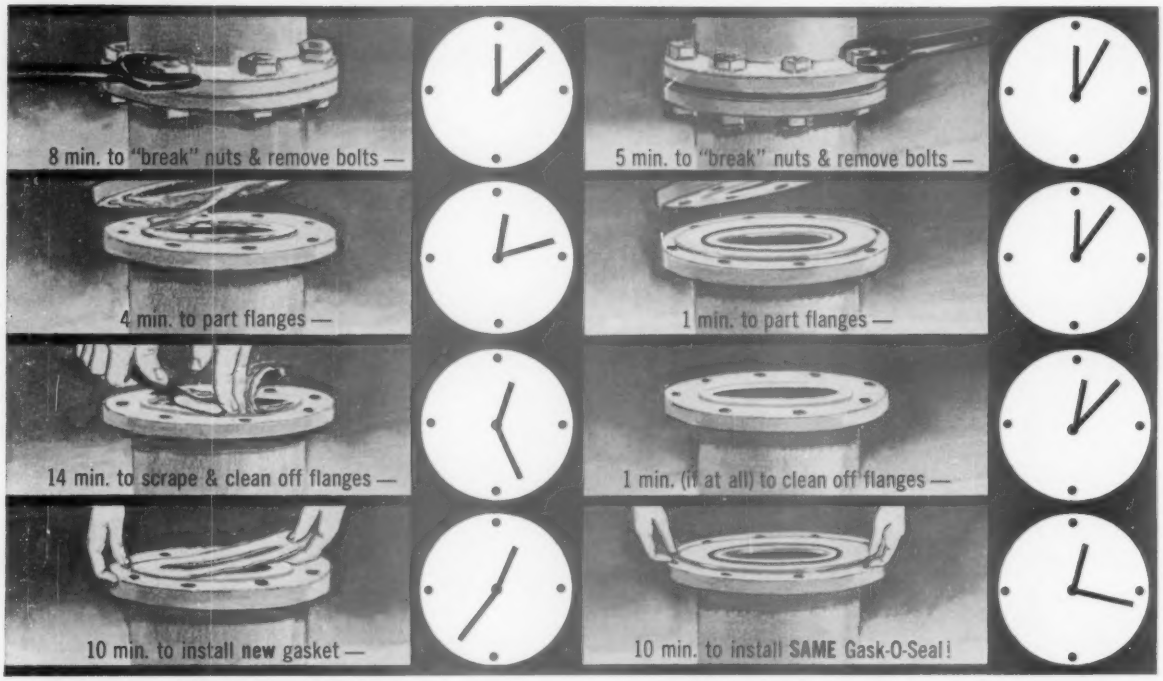
© Division of Armour and Company

110 NORTH WACKER DRIVE • CHICAGO 6, ILLINOIS



HOW TO SAVE *19 MINUTES* EVERY TIME YOU REPLACE A GASKET!

WITH ORDINARY GASKET | **WITH GASK-O-SEAL**


8 min. to "break" nuts & remove bolts —
4 min. to part flanges —
14 min. to scrape & clean off flanges —
10 min. to install new gasket —
5 min. to "break" nuts & remove bolts —
1 min. to part flanges —
1 min. (if at all) to clean off flanges —
10 min. to install SAME Gask-O-Seal!

TOTAL TIME 36 MINUTES | **TOTAL TIME 17 MINUTES**

Fourteen major industrial plants report that it takes an **average** of 36 minutes to replace an ordinary gasket in standard ASA flanges . . . **with Gask-O-Seals it takes less than 17 minutes!**

There is no scraping or time consuming cleaning of flange faces necessary when you use Gask-O-Seals; no damaged flanges to be re-surfaced or replaced. And, Gask-O-Seal offers many other cost reducing features:

- They will not "blow-out".
- No retorquing of bolts is necessary.
- Vibration or pulse does not effect seal.
- They provide an opportunity to up-grade flanges — to reduce weight, bulk, bolt sizes and numbers . . . plus many more features.

Why not find out how Gask-O-Seals can save **you** time and effort. We'll be glad to send you complete information.

Write for Catalog 5422

Parker SEAL COMPANY
Culver City, California and Cleveland, Ohio
A DIVISION OF PARKER-HANNIFIN CORPORATION

Here is the world's first quintuple string producing well

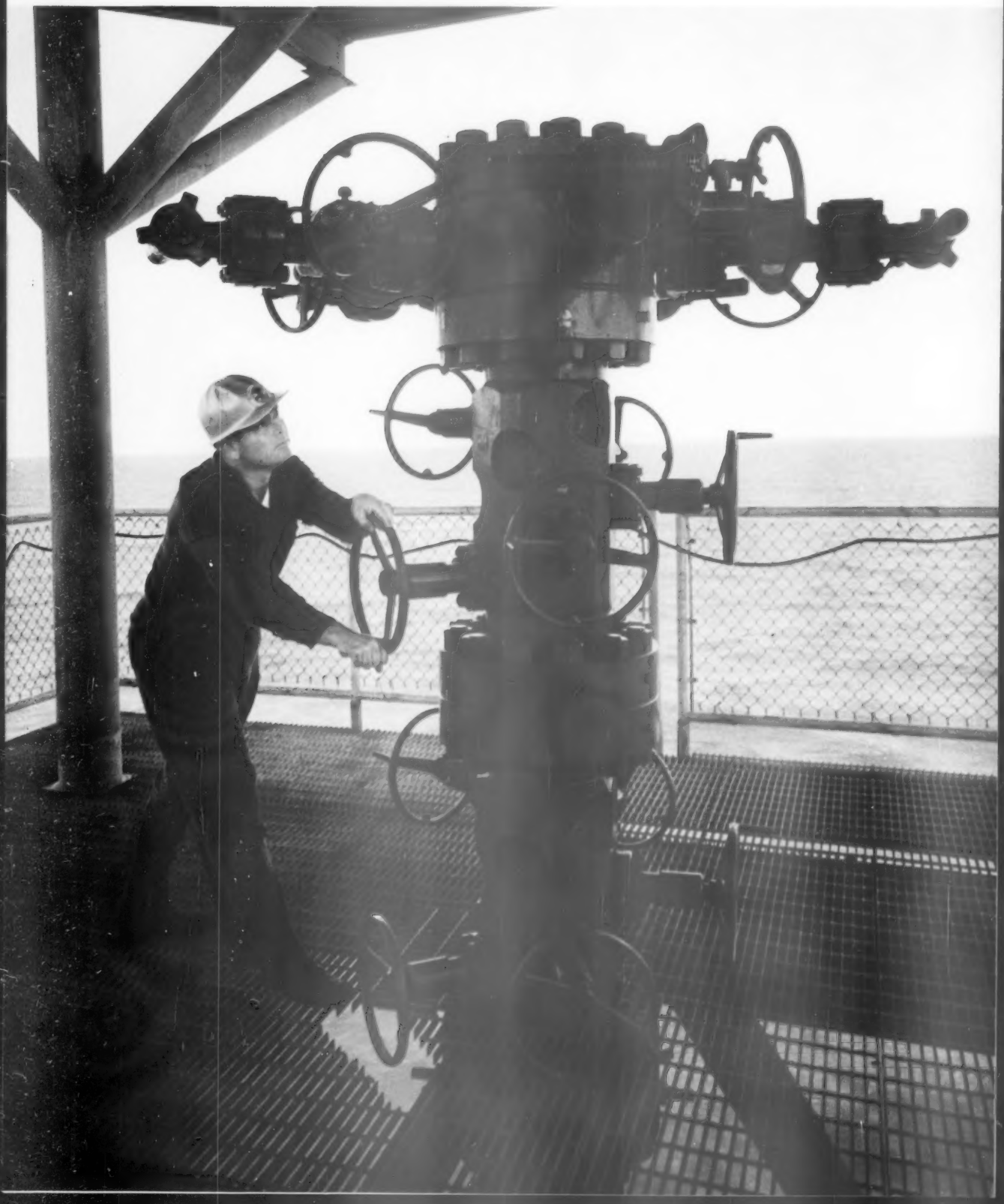
It was drilled to 7,981 feet by a National 1625 Diesel Electric Rig. It is producing through a total of 34,029 feet of tubing, of which 24,005 feet is 2⅜" O.D. Spang Extreme Line Tubing (plastic coated)

AND HAS A . . .

THE NATIONAL NSCO SUPPLY COMPANY

Unique quintuple wellhead

From the bottom of the tubing spool to the top flow line plugs, this National Supply wellhead is 10 feet 1 inch high and weighs approximately 9,100 lbs. The well tested a total of 492 million cf/d of gas on open flow from six zones, five of which are producing simultaneously.



designed by National Supply!

Forty miles off the Louisiana coast is the world's first quintuple string producing well. Its history-making wellhead is a product of National Supply. Ten feet, one inch high and weighing over 9,000 lbs., the wellhead was designed, assembled and tested at National Supply's Houston Plant.

Sinclair Oil and Gas Company and partners completed this 7,981-ft. well in six zones, five of which are producing simultaneously. All five tubing strings were run simultaneously. From the uppermost flow line plugs to the bottom of the hole, the first quintuple well represents a triumph in engineering, equipment and operating techniques.

A wellhead "first" isn't new for National Supply. National Supply designed the first fully independently run dual tubing string assembly, installed in 1954 on a West Texas well. Other examples of National wellhead leadership are:

First fully flanged independent multiple string tree with sealed-in-steel seals.

First multiple string tubing hanger and wrap-around pack-off for multiple tubing string manipulation with Christmas tree control.

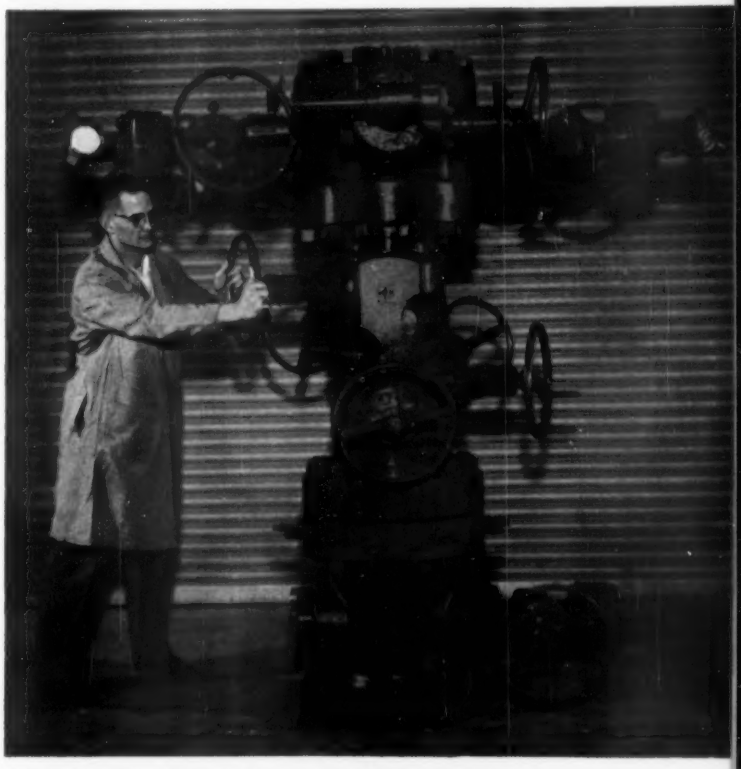
First to separate the slip load due to casing weight and the packing load resulting from formation pressure.

National wellhead features are unexcelled, as proved by these 10 major reasons for using National multiple string heads:

1. NATIONAL Multiple String Heads are available in four basic designs to suit any requirement, can handle applications from low pressure pumping to high pressure gas or oil wells.
2. Provide maximum flexibility and safety.
3. Afford *complete independence* for each producing zone.
4. Handle completion cycle in manner similar to single completion . . . using same design of equipment, but reduced in size to permit handling two or more tubing strings.
5. The Laurent seal* — "sealed-in-steel" — is used for higher pressures.
6. Hangers are self locating.
7. Simplicity characteristic of conventional equipment is found in the multiple string design.
8. Maximum interchangeability of multiple tubing string hangers in the same wellhead body.
9. Plastics or liquids are not required to effect the seals.
10. National Supply's many years of engineering experience stand behind the design of the multiple string equipment.

Talk with the National Supply representative in your area before you buy another wellhead. He has more information you can profitably use.

*Patent No. 2,687,229

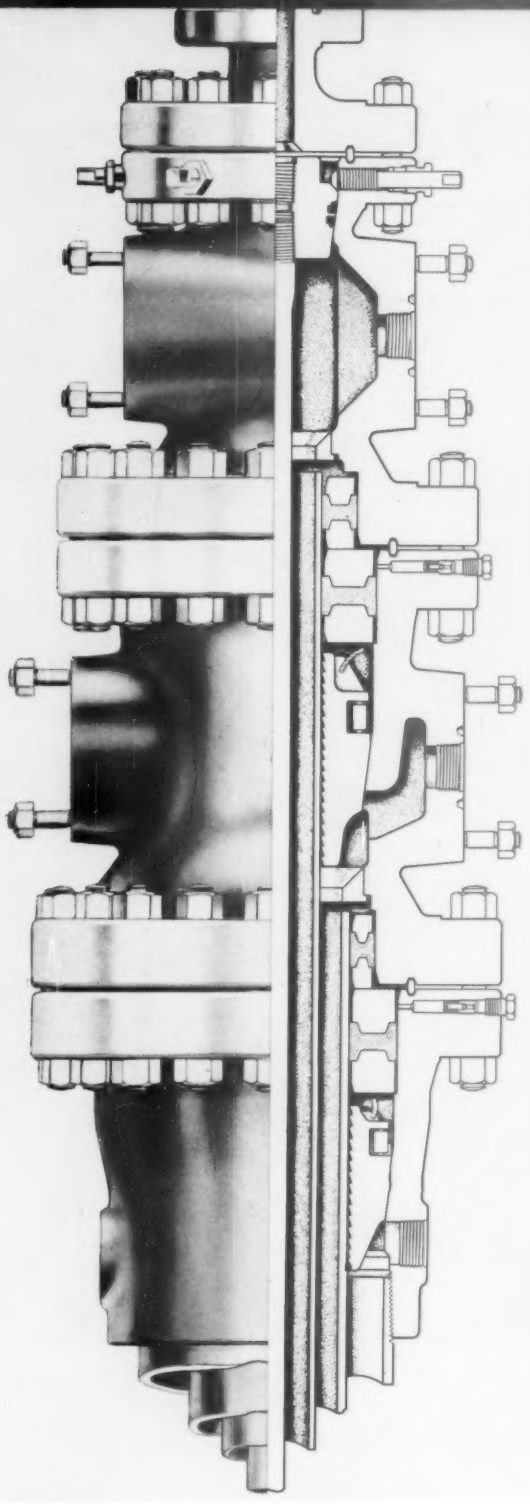


Quintuple wellhead was designed, assembled and tested in National Supply's Houston Plant. Tubing spool, tubing hanger, quintuple port flow tee, crown member and flow fittings were made by National Supply.

A 16 mm color sound film on the world's first quintuple completion well is available for group showings. If your group would like to see this film, please write to: Sales Manager, Production Equipment, The National Supply Company, Pittsburgh 22, Pennsylvania.

Steel

Steel's Symbol of strength, long life, and economy



Triple record set by NATIONAL Type B Wellhead Equipment!

Here's the latest big performance record on National Type B Wellhead Equipment —

1. Was selected to suspend the *longest* string of casing ever run in a well
2. Selected for two of the last three record depth wells
3. **It has never contributed to a casing failure**

This 3-way record proves the value of advanced design and engineering which gives National Wellhead Equipment the highest safety factor for every application. One outstanding example of this advanced design is the counterbored casing flange which permits separation of pressure and slip loads, and is usable with all standard blowout preventers (see drawing).

All National Wellhead bodies and components are rigorously tested at levels above those recommended by API—another assurance of dependability and safety in service. National Type B Wellhead Equipment is manufactured in a complete range of sizes, with casing heads, casing spools and tubing spools available for working pressures up to 15,000 p.s.i. Ask the National Supply representative in your area to tell you about the other advantages you gain—including the advisory services of National Supply's wellhead equipment specialists.

◀ This drawing of Type B Wellhead Equipment illustrates the pressure-packed principle employed to separate pressure loads from slip loads.

THE NATIONAL SUPPLY COMPANY

Two Gateway Center, Pittsburgh 22, Pennsylvania

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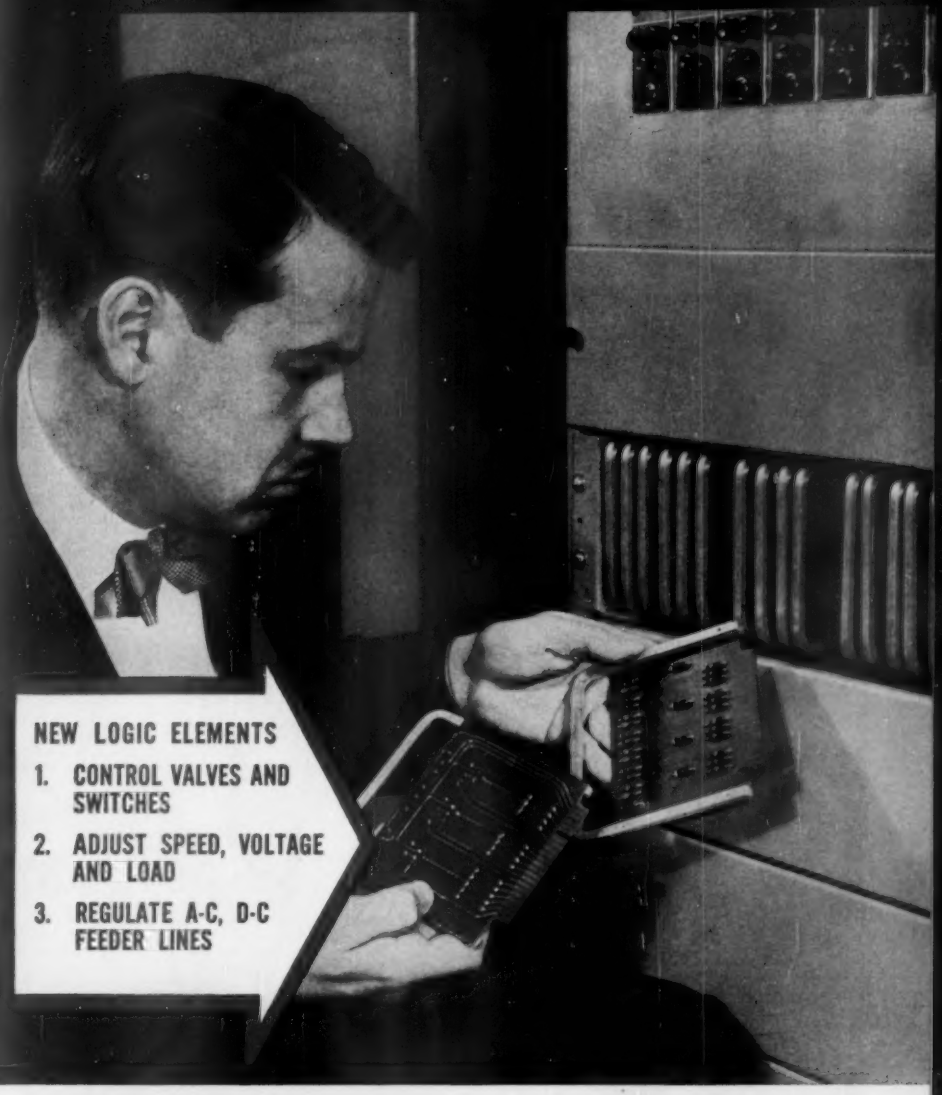


NEW GENERAL ELECTRIC **SOLID-STATE** SUPERVISORY OFFERS...

Versatile, Economical Remote Control for a Variety of Applications

New General Electric solid-state supervisory equipment, with pre-tested transistorized logic elements, is now available to control and supervise any piece of electrical apparatus having provision for local control. No matter what the application—in pipeline and petroleum industries, electric utilities, industrial power distribution applications, or in commercial building and municipal projects—this equipment now provides better operational programming and improved utilization of equipment and personnel.

You also get top economy. In addition to impressive application versatility, G-E solid-state supervisory offers important money-saving features. You save up to 50 percent on costly space. Time-saving ease of installation is afforded by 25 percent reduction in equipment weight.

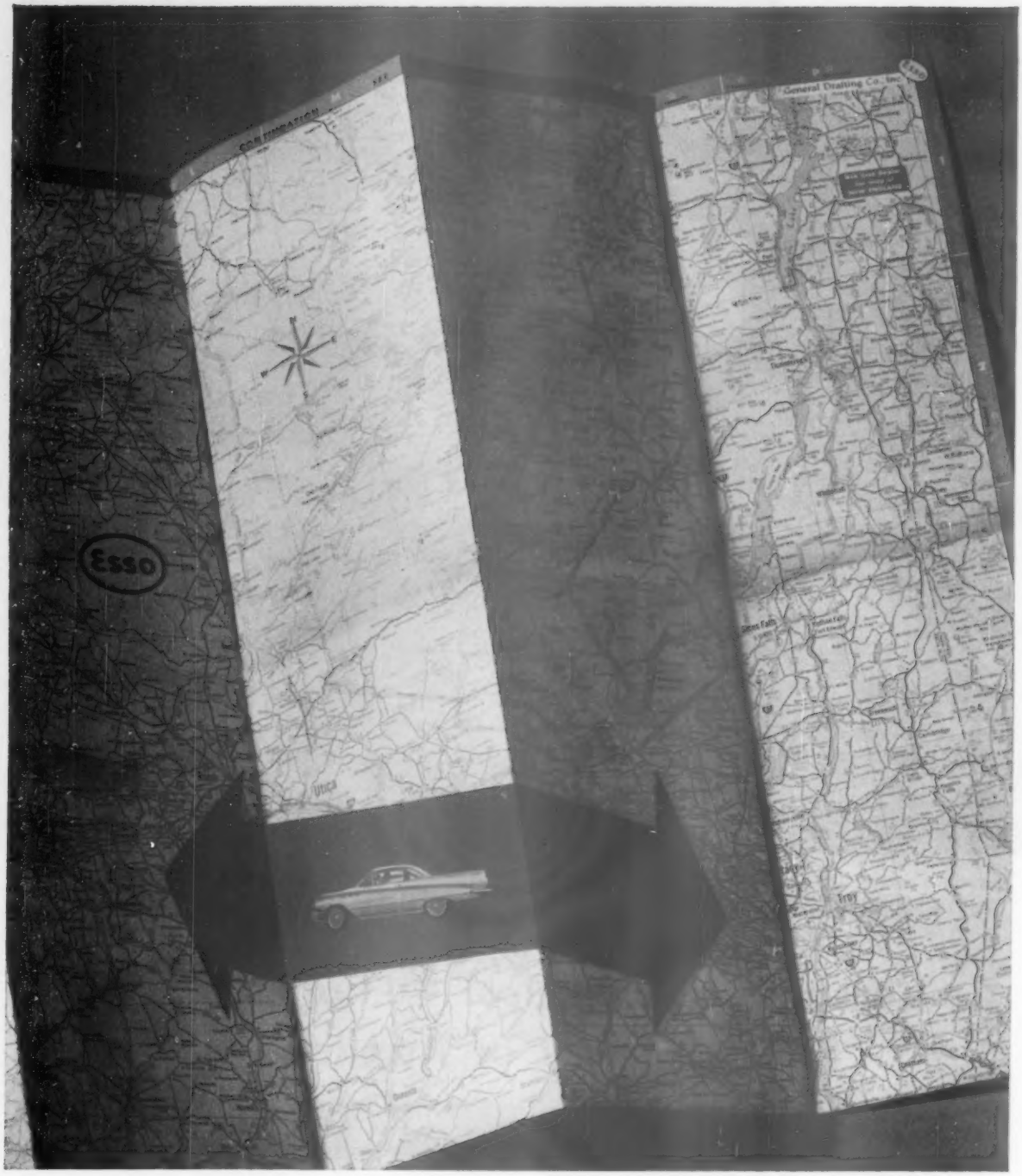
Once installed, maintenance is cut drastically because the new logic elements have no moving parts, require no adjustments. Solid-state logic elements on plug-in cards are available for off-the-shelf delivery.

If you need versatile remote control for your equipment, it will pay you to get all the facts on solid-state supervisory control by General Electric. Contact your nearest Apparatus Sales Office today, or write for publication GEA-7043, General Electric Co., Schenectady 5, New York.

313-12

Progress Is Our Most Important Product

GENERAL ELECTRIC

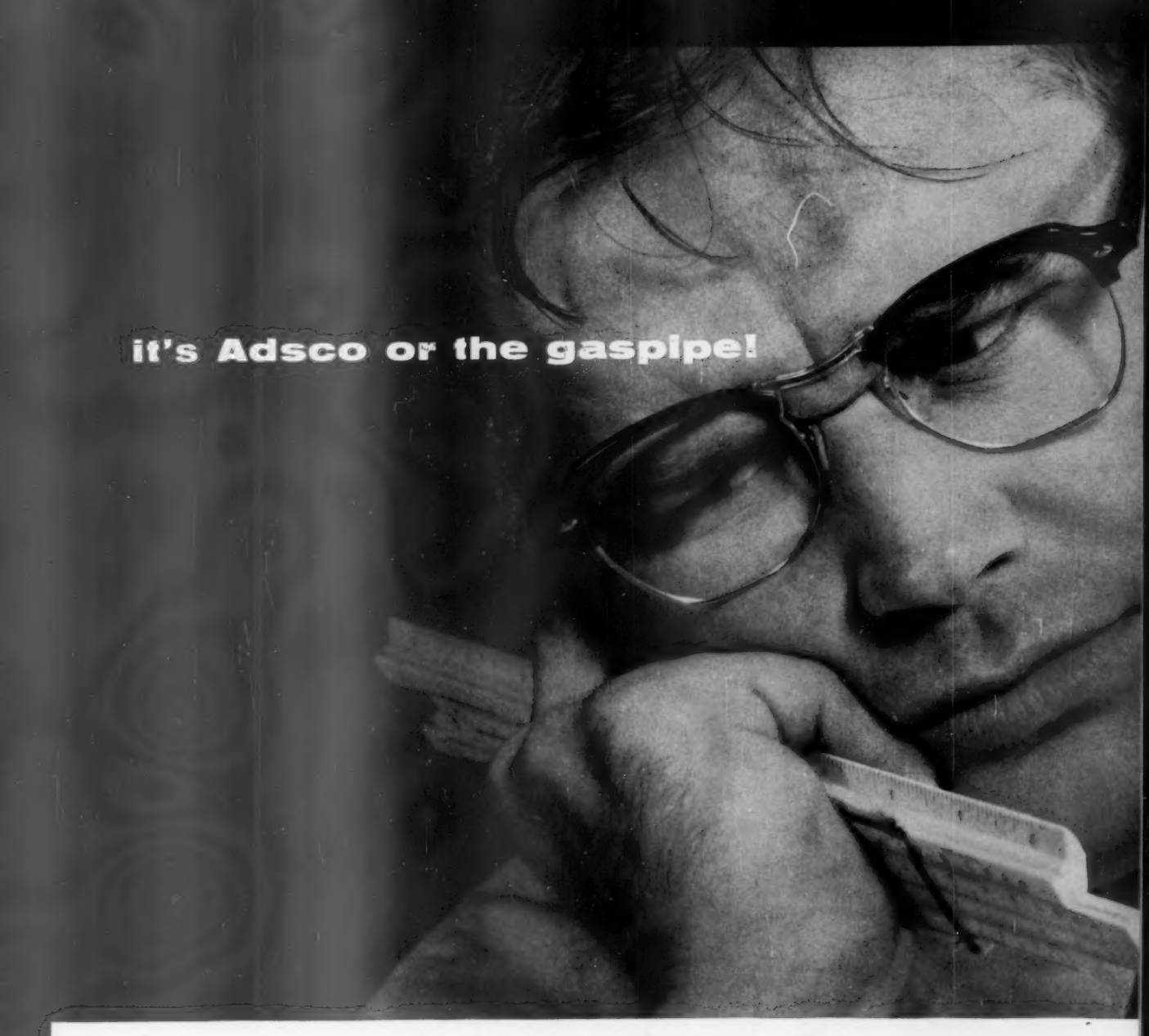


"If every car traveled another 100 miles a year, U. S. gasoline consumption would rise one per cent. This means only another two to three hours of driving each year, or less than four more minutes a week behind the wheel. Yet one per cent is about 10 million barrels of gasoline a year!... The API program to promote more travel deserves the backing and support of every branch of the industry."

—M. J. Rathbone, President

Standard Oil Company (New Jersey)

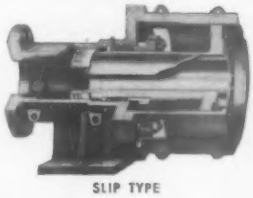
Esso



ONLY ADSCO HAS ALL 3 TYPES OF EXPANSION JOINTS

CORRUFLEX PACKLESS

RAM-PAK



SLIP TYPE

Choose Adsco, by all means. An Adsco man is no farther away than your telephone. He's a calm, cool and collected fellow who can straighten out any expansion problem in your piping system. He loves to be asked . . . call him quick, man, before it's too late!

Write for comprehensive catalogs

ADSCO ENGINEERED PRODUCTS

Sold, Engineered and Manufactured by

YUBA HEAT TRANSFER DIVISION

HONESDALE, PA.

World's Oldest and Largest Manufacturer of Packed and Packless Expansion Joints

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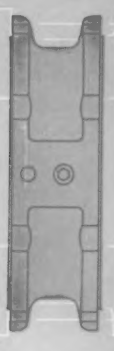

fits between the flanges ○ ◎ **less space—weighs only 10% as much**

Mission Duo-Chek valves

Mission Duo-Chek Valves weigh approximately 10 per cent as much as conventional check valves. Smaller, lighter Duo-Chek Valves mean that you save on space, weight, installation, and price. But, you are getting a check valve with a bubble-tight seal, anti-slam closure, long life built in. No load is carried on the plate hinges. No external parts. No lubrication required.

The sine wave seal prevents seepage, yet holds without leaking or distortion at maximum test pressure. The sealing material is molded and bonded into a metal groove, making an "O"-ring type seal. Pressure deforms the packing. Metal-to-metal contact completely encloses the sealing material, preventing pinching off under pressure. Available in steel, 316 stainless, aluminum, and bronze to fit ASA raised face or ring joint flanges.

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They Say—

Cuts reversed

Dear Sir:

Please refer to the Foreman's Page, June 6, ("Fluid Flow," Part 8, p. 128). Illustrations 5A and 5B are reversed.

B. L. Aldridge
Crown Central Petroleum Corp.

Editor's note: Reader Aldridge is correct. The next installment of the Foreman's Page, June 20, page 132, carried a notice of this error.

They'll be watching

Dear Sir:

I find "Watching Washington" interesting and informative.

When the Senate has enacted the helium bill, please publish the result and its significance to the industry.

I and a number of your readers will be interested, especially those in Arizona who are looking forward to the establishment of a helium extraction plant.

Marion H. Andrews
Springfield, Ill.

Too many outlets?

"Something in excess of 15% of the industry's service stations do not contain enough business potential to provide a living for a dealer.

"The industry can no longer afford the luxury of these strength-sapping outlets and their elimination would do much to restore its economic health."

J. H. Picou, director of advertising and promotion, Atlantic Refining Co., in a speech to the Virginia Gasoline Retailers Association.

Danger in a narrow path

"We must make very sure that our educational institutions don't take our students down a narrow, specialized path.

"Specialization within the engineering field is of vital importance to the future careers of graduates, but too much specialization at the undergraduate level is dangerous both to the profession and to the individual.

"At the undergraduate level, we need more solid generalization founded upon the basic principles applicable in all the engineering disciplines, and then more specialization in the years of graduate study or on the job.

"The practicing engineer, too, must

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PART OF THE DEAL

When you order oil well, refinery and industrial supplies — prompt delivery of exactly what you ordered and fast service are automatically a part of the deal. You can rely on HENRY H. PARIS DISTRIBUTOR, INC. for the following nationally known products:

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continue to acquire new knowledge which so steadily and relentlessly is accumulating, if he is to keep abreast of the requirements of his profession.

"In a very vital respect, the future of our nation depends upon the quality of our engineering competence."

Eugene McDermott, chairman of the executive committee, Texas Instruments, Inc., speaking at Stevens Institute of Technology.

What's reasonable?

"Some people refer to the pressures of countries which are crude-oil producers to sell their crude as 'national' oil policies.

"If this is a correct description, then we too have had a national oil policy because our government at Ottawa has undoubtedly done its best to urge the Washington government to accept Canadian crude on a substantially equal basis with American produced crude, thereby permitting it to compete in those U. S. areas which are natural economic markets for Canadian crude.

"As you know, that was achieved a little more than a year ago and represents a major achievement in Canadian-American trade relations.

"There will naturally be ups and downs in our exports to the United States. But over a period of time, the fact that the Canadian crude is now accessible to major American markets in the northern states from the Pacific Coast to Lake Erie, where total refinery capacity is about 1,250,000 bbl. per day, is of great significance.

"You may ask, 'Didn't Capt. Carson's recent speech in Calgary put a damper on our hopes for increasing substantially the exports to the U. S.?'

"We do not view his comments with any pessimism. I would like to quote part of his speech relating to this: '. . . A reasonable and natural growth of Canadian exports into the markets mentioned will be accepted and welcomed, but attempts to supply more rapidly than the market could absorb quite understandably would displease some people in the States.'

"The key word 'reasonable' is, of course, a matter for interpretation. Volumes of exports from Canada which should appear reasonable from the U. S. standpoint could, at the same time, be considered substantial from the Canadian viewpoint, and with the growth factor, the longer range prospects are even more encouraging."

Vernon Taylor, vice president, Imperial Oil Ltd., in a speech to the council of the Edmonton Chamber of Commerce.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

The sentinel that never gets relief... Day after day after day, for over 4 years this Beckman oxygen analyzer has maintained vigil on catalyst regeneration. Located eight stories above The Texas Company refinery at Wilmington, California, it has monitored unreacted oxygen, under demanding conditions, with only minimum routine maintenance. Analysis must be continuous, dependable, accurate. ⌘ This Beckman instrument is the only oxygen analyzer to use a direct paramagnetic measurement exclusively, which brings you these advantages: *Dependability...* under the most rugged conditions. *Simplicity...* with no auxiliary measurements to complicate analysis, no extra components requiring extra maintenance. *Accuracy...* with sensitivity and specificity to meet the most critical process requirements. ⌘ Whatever your application, if you want detailed specifications on an oxygen analyzer that withstands tough environments and gives you continuous, dependable answers, write for Data File 24-29-08.

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Full circle contact of the ball and cone metal-to-metal seats always makes a tight seal.

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HOUSTON, TEXAS

WECO Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

CALENDAR OF EVENTS

JULY

11-20 University of Michigan, engineering summer conference, applied mathematics for chemical and metallurgical engineers, Ann Arbor, Mich.

18-29 Massachusetts Institute of Technology, dynamics and control of chemical engineering processes program, Cambridge, Mass.

28-30 American Petroleum Institute, Division of Production, Eastern district meeting, The Greenbrier, White Sulphur, Springs, W. Va.

29 Southern Gas Association, transmission section roundtable conference on use of electronic computers by engineering personnel, and employe relations section accident prevention roundtable conference, Baker Hotel, Dallas.

AUGUST

3-5 Wyoming Geological Association, field trip to Snyder basin and Wind River Mountains, Casper.

14-19 National Congress of Petroleum Retailers, Inc., annual session, Shamrock-Hilton, Houston.

15-16 North Dakota Oil and Gas Association, annual meeting, Grand Pacific Hotel, Bismarck.

15-17 American Society of Mechanical Engineers, American Institute of Chemical Engineers, heat transfer conference and exhibit, Statler Hilton Hotel, Buffalo, N. Y.

15-26 Sacramento State College, summer institute on nondestructive testing, Sacramento, Calif.

22-26 Gordon Research Conference, catalysis, Colby Junior College, New London, N. H.

29-31 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, W. Va.

30-Sept. 2 American Association for the Advancement of Science, Alaska Division, eleventh Alaskan science conference, Anchorage.

SEPTEMBER

6-7 Chemical Institute of Canada, organic chemistry division conference, Edmonton.

7-9 American Society of Mechanical Engineers, joint automatic control conference, Massachusetts Institute of Technology, Cambridge, Mass.

7-10 Billings Geological Society, annual field trip, Hebgen Lake-Madison Valley area of southwestern Montana.

8-9 National Research Council, Chemical Institute of Canada, tenth Canadian high polymer forum, Alpine Inn, Montreal.

8-9 Mid-Continent Oil and Gas Association, Louisiana - Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

8-10 Chemical Institute of Canada, western regional conference, Regina.

8-10 Intermountain Association of Petroleum Geologists and Eastern Nevada Geological Society, field trip, economic geology of east-central Nevada.

11-16 American Chemical Society, national meeting, New York City.

14-15 Western Petroleum Refiners Associ-

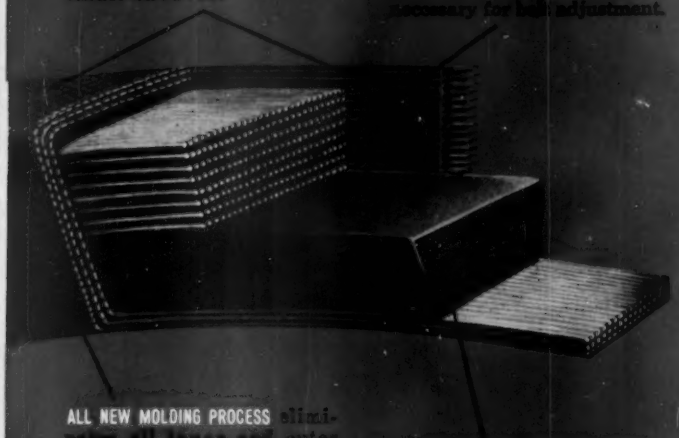
NEW C-E GREEN TRIANGLE SUPER V-BELTS

40% MORE CAPACITY

.. NO PRICE INCREASE

ALL NEW COVER cured by a special technique which molds NEW-type fabrics into a rugged, flexible unitized cover . . extends operational life . . bends easier over small sheaves.

ALL NEW CORDS Each fiber of the cord is impregnated with latex, not merely surface coated. Cords are built into the belt under tension with super-proof electronic precision, so *each* cord pulls its full share of the load uniformly with maximum shock resistance. Uniform tension on cords prevents belt turning over in grooves and reduces stretch, so less downtime is necessary for belt adjustment.



ALL NEW MOLDING PROCESS eliminates all inner and outer joints and laps for *even longer* belt life.

ALL NEW BOTTOM RUBBER COMPOUND has been beefed-up for longer life.

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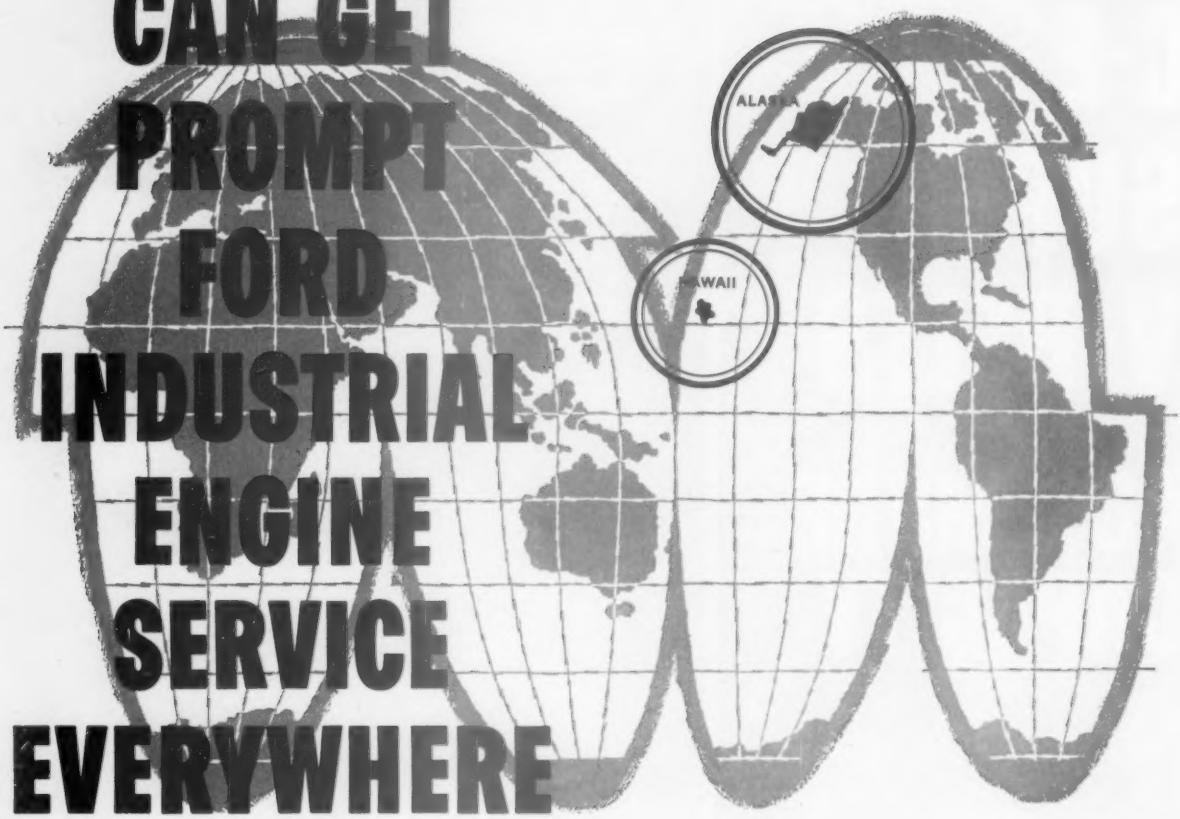

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→ FORD INDUSTRIAL ENGINE DEPT., P.O. BOX 1666, RICHMOND, CALIF.

ation, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

14-16 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

15 Natural Gasoline Association of America, Rocky Mountain regional meeting, Palliser Hotel, Calgary.

15-16 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual engineering management conference, Morrison Hotel, Chicago.

16-17 Kansas Geological Society, twenty-fifth annual field conference, northeastern Oklahoma, Western Hills Lodge, Wagoner, Okla.

18-21 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Jung Hotel, New Orleans.

19-21 Texas Mid-Continent Oil and Gas Association, annual meeting, Hilton Hotel, San Antonio, Tex.

21-23 Pacific Coast Gas Association, annual meeting, Westward Ho Hotel, Phoenix.

25-27 American Association of Oilwell Drilling Contractors, annual meeting, Roosevelt Hotel, New Orleans.

25-28 American Institute of Chemical Engineers, meeting, Mayo Hotel, Tulsa.

25-28 American Institute of Electrical Engineers, petroleum industry committee, electrical conference of the petroleum industry, Hotel Skirvin, Oklahoma City.

26-29 American Welding Society, fall meeting, Penn-Sheraton Hotel, Pittsburgh.

26-30 Instrument Society of America, instrument-automation conference and exhibit, and fifteenth annual meeting, Coliseum, New York.

27-29 Mid-West Gas Association, annual school and conference, Memorial Union, Iowa State College, Ames.

29-30 Mid-Continent Oil and Gas Association, Mississippi-Alabama division meeting, Grand Hotel, Point Clear, Ala.

29-Oct. 1 West Texas Geological Society, field trip, Delaware Basin of West Texas and southeast New Mexico.

OCTOBER

2-5 Society of Petroleum Engineers of AIME, annual fall meeting, Denver.

3-4 Independent Natural Gas Association of America, annual meeting, Fontainebleau Hotel, Miami Beach.

4-5 University of Kansas, gas-measurement institute, National Guard Armory, Liberal, Kans.

6-7 National Association of Corrosion Engineers, annual western region conference, Sheraton - Palace Hotel, San Francisco.

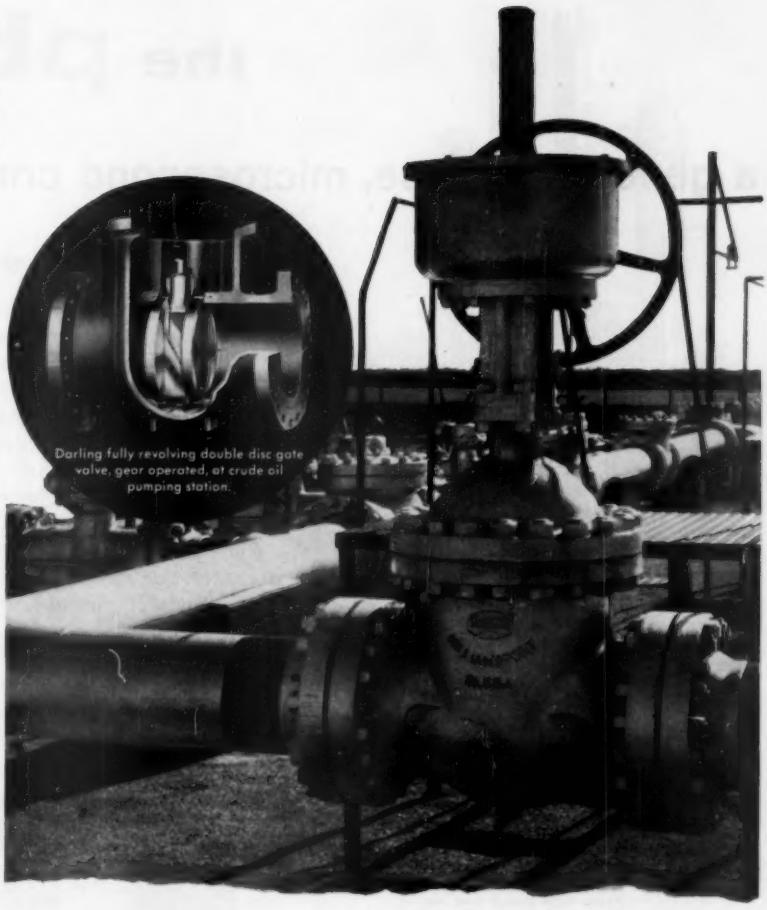
6-8 National Association of Corrosion Engineers, southeast region conference, Dinkler - Plaza Hotel, Atlanta, Ga.

6-8 National Academy of Sciences, National Research Council, ninth national clay conference, Purdue University, Lafayette, Ind.

10-12 American Gas Association, annual convention, Atlantic City.

11-14 National Association of Corrosion Engineers, northeast region conference, Prichard Hotel, Huntington, W. Va.

12-14 Southwestern Federation of Geo-



This DARLING gate valve feature can help you

KEEP UP THE GOOD WORK!

Almost all gate valves start out doing a good job. But it's very doubtful if *any* others can match Darlings for prolonged easy closure and freedom from downtime.

It's largely the Darling *fully revolving double discs with parallel seats* (shown above) that make the difference! This principle minimizes friction and uniformly distributes whatever wear there is. What's more these valves can "live" with the line stresses and surges that cause other valves to fail.

Why not get more familiar with how these Darling valves perform and what they offer you in avoiding trouble and downtime? Simply ask for Catalog No. 57.

DARLING VALVES

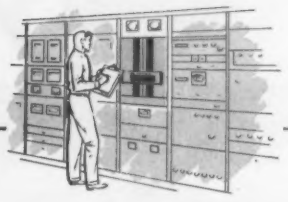
DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

the pb 250

a general purpose, microsecond computer for $30,000



The design of the PB 250 enables it to be mounted as a systems component in 31½ in. of a standard relay rack.

SPECIFICATIONS

TYPE
Serial, binary, internal program.

COMMAND STRUCTURE
Single address with index register. 46 commands.

OPERATION TIMES (22 bit word)

Add/subtract	12 μsec.
Multiply	276 μsec. (max.)
Divide	252 μsec. (max.)
Square root	252 μsec. (max.)

MEMORY
Type: Magnetostrictive delay lines.
Capacity: 1,808 words standard, expandable to 15,888 words.

INPUT-OUTPUT
Standard: Automatic typewriter, paper tape punch and reader, 30 control inputs, 32 control outputs, high-speed block input-output (85 KC word rate).
Optional: High-speed paper tape punch and reader, magnetic tape units (six maximum) employing IBM 700 series format, punched card equipment.

DIMENSIONS
30 in. high, 19 in. wide, 24 in. deep.

POWER REQUIREMENT
115 volts, 60 cycles, at 100 watts.

COMPLETELY SOLID STATE

Outstanding features of the PB 250 include: • MICROSECOND SPEED: Addition and subtraction require 12 microseconds. Multiplication takes 276 microseconds and division 252 microseconds. • EXPANDABLE MEMORY: Minimum capacity of 1,808 words, expandable to 15,888 words. External core memory of 16,384 words available. • COMMAND STRUCTURE: Versatile command list of 46 instructions. • SIMPLE PROGRAMMING: Internally programmed, single address instructions, command indexing, and automatic double precision operations. • INPUT-OUTPUT SYSTEMS: Automatic typewriter, paper tape reader, and punch standard. Complete range of peripheral equipment available. • EXCEPTIONAL RELIABILITY: Conservative solid-state design, small component count, and absence of moving parts. • SYSTEMS INTEGRATION: May be integrated into existing systems, on- or off-line. Ability to operate as universal format-to-format converter.

PACKARD BELL COMPUTER
A Subsidiary of Packard Bell Electronics
1905 Armacost Avenue, Los Angeles 25, California • GR 8-4247

• 3-7-60 PB

logical Societies, annual meeting, Wooten Hotel, Abilene, Tex.

13-14 California Natural Gasoline Association, annual fall meeting, Hotel Miramar, Santa Monica, Calif.

13-16 Taft, Calif., Oildorado, fiftieth anniversary celebration.

17-19 American Society of Mechanical Engineers, American Society of Lubrication Engineers, lubrication conference, Statler Hilton Hotel, Boston.

17-19 University of Minnesota, Pennsylvania State University, Colorado School of Mines, biannual symposium on drilling and blasting, Golden, Colo.

19-20 National Association of Corrosion Engineers, north central region conference, Schroeder Hotel, Milwaukee.

19-21 Gulf Coast Association of Geological Societies, convention, Biloxi, Miss.

19-21 Rocky Mountain Oil and Gas Association, annual convention, Brown Palace Hotel, Denver.

20-21 American Institute of Mining, Metallurgical, and Petroleum Engineers, Los Angeles Basin, fall meeting, Huntington Sheraton Hotel, Pasadena, Calif.

20-23 Odessa Oil Show, Odessa, Tex.

23-25 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

24-25 American Society of Mechanical Engineers, American Institute of Electrical Engineers, fuels conference, Daniel Boone Hotel, Charleston, W. Va.

25-28 National Association of Corrosion Engineers, south central region conference, Mayo Hotel, Tulsa.

26-27 Armour Research Foundation of Illinois Institute of Technology, computer applications symposium, Morrison Hotel, Chicago.

26-27 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

28 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

NOVEMBER

3-4 American Association of Petroleum Geologists, Pacific section, annual meeting, Ambassador Hotel, Los Angeles.

3-4 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-9 Chemical Institute of Canada, chemical engineering division, conference, Quebec City.

7-10 Society of Exploration Geophysicists, international meeting, Moody Convention Center, Galveston, Tex.

14-16 American Petroleum Institute, fortieth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

15-16 University of Kansas, natural-gas pipeline institute, Courthouse, Liberal, Kans.

18 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

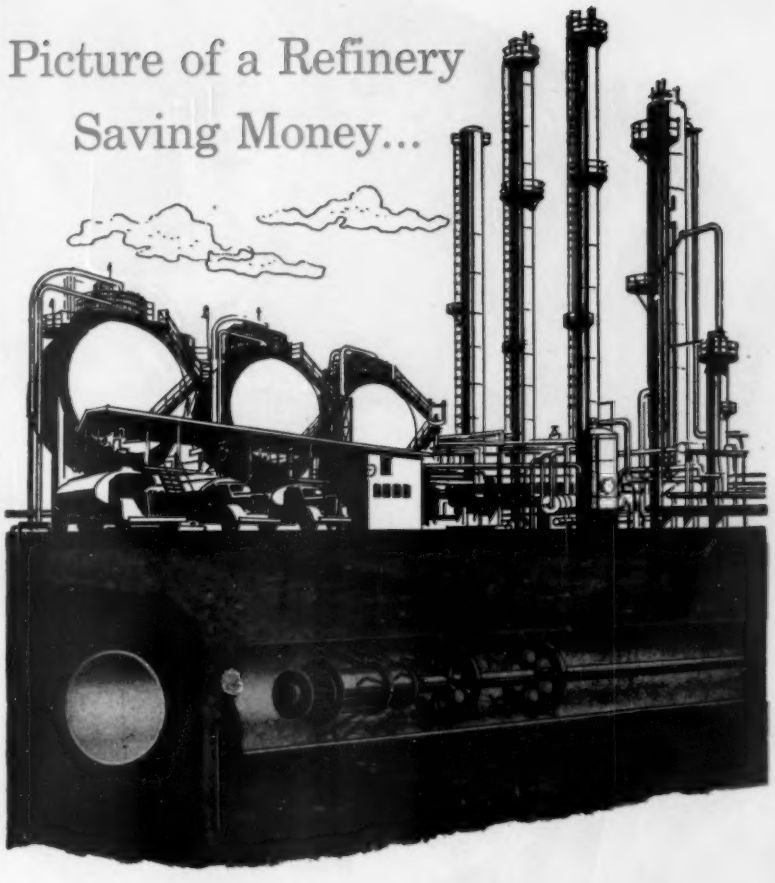
27-Dec. 2 American Society of Mechanical Engineers, winter annual meeting, Statler Hilton Hotel, New York.

DECEMBER

4-7 American Institute of Chemical Engineers, meeting, Statler Hotel, Washington.

5-7 Interstate Oil Compact Commission, annual meeting, Westward Ho Hotel, Phoenix.

Picture of a Refinery Saving Money...



Spunline Relines Pipe Lines in-place without removing the pipe

Another refinery, it could be in Texas, California or Montana, will soon be enjoying the savings of another rehabilitated pipe line. The flow will increase, the pumping cost will drop and the pipe line will be good as new for at least another quarter of a century.

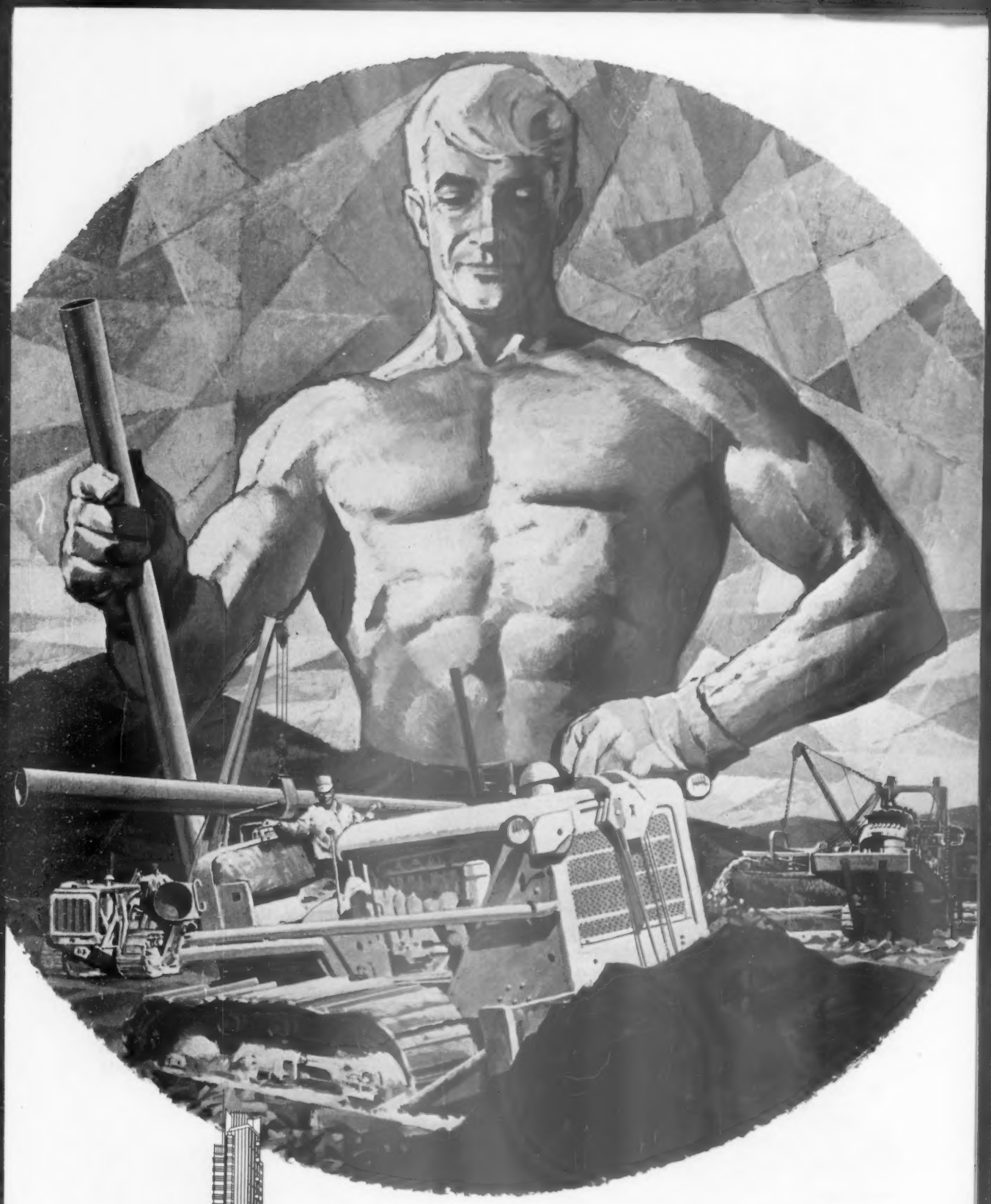
And traffic will move without interruption or inconvenience to the public.

Spunline® is applicable to pipe lines down to 4" and may be used in cast iron, steel, concrete and wrought iron pipe lines.

Write, wire or phone **PIPE LININGS Inc.**

Subsidiary of American Pipe and Construction Co.

2414 East 223rd Street, Wilmington, California
P.O. Box 457 • Phones: SPruce 5-3273 — TErminal 5-8201
Rail Address, Pacific Electric, Watson, California



"...pacing the pipeline construction industry
for more than a quarter century"

price tower H·C·PRICE·CO PIPELINE CONSTRUCTORS bartlesville, oklahoma

50 years ago

July 14, 1910

United Fuel & Gas Co., Standard Oil Co. subsidiary, takes over properties of Pittsburgh-based Inter-State Gas Co. in one of the East's largest mergers. Merger with Inter-State, a $1,000,000 West Virginia corporation, gives Standard virtual control of all gas properties in that state.

Sixty years after the discovery of petroleum on Oil Creek, roads running through that part of Pennsylvania are being sprinkled with refinery residuum to keep down the dust kicked up by automobiles and other swift vehicles. It is one of the wonders of the age that in this area where the greatest quantities of crude oil are produced, millions of barrels of oil are held in storage, and thousands of barrels have been permitted to go to waste, no one has ever thought until now to use some of the oil to relieve people living along the highways from the discomforting clouds of dust.

25 years ago

July 11, 1935

Several major oil companies are getting ready to launch a systematic and thorough geophysical exploration for salt domes in the Gulf of Mexico off the coast of Texas and Louisiana. They claim there is ample evidence of oil fields in the gulf, and believe that geophysical and drilling operations are feasible as far as 3 miles from shore.

First use of butane as a fuel for engines on a drilling rig in the Mid-Continent region is being made on a wildcat test being put down by Amerada Petroleum Corp. and Stanolind Oil & Gas Co. in Coal County, in southeastern Oklahoma. Success of the venture may open a new market outlet for butane and propane which normally are waste byproducts of gasoline-plant operation.

10 years ago

July 13, 1950

Plans announced for a giant gas-conservation project in Scurry County, West Texas. Project, participated in by 35 operators and casing-head-gas owners, involves 35,000 producing acres in the North Snyder, Kelley-Canyon, and Diamond "M" fields. Sunray Oil Corp. named group operator.

Cities Service Oil Co. disposes of all its western Pennsylvania petrolum properties, except distribution and marketing facilities, in sale to Quaker State Oil Refining Corp. Included are production and gathering systems in Venango, Warren, and Forest counties, and its 3,000-bbl. refinery at Titusville.

JOURNALLY SPEAKING

Dope 'Em Right

WE HARDLY ever reprint things from other people's columns (unless we can twist them around to make them look like our own invention), but a friend sent us a clipping that we are going to use verbatim because it's about us, it has a point, and it's funny.

It's from a column of chitchat that appears in the Denver Post. But before you can appreciate it you have to put yourself in the proper mood by trying to forget everything you ever knew about the oil business.

Imagine, if you can, that you are the Old Lady from Dubuque who never heard any of the terms that oil operators and equipment men use all the time. You think beans are for Boston, nipples are for babies, and water flooding is what happens when the pipes break.

Ready? Okay, here's the quote:

"THE DENVER POST'S Lee Olson doesn't know much about gas and oil, but likes to collect sales slogans from the highly technical ads that appear in The Oil and Gas Journal. He baffles himself this way. Among his current list of incomprehensibles:

"NEXT TIME TRY a Baroid Mud Program. This Hose Keeps the Joint from Jumping. Need a Road Map 14,000 Feet Down? What's Back of Gaso Leadership in Water Flooding? This Bean Lasts for the Flowing Life of a Well. You, Too, Can Get Dehydration at a Profit. Do You Still Weld Shoes and Collars to Casing? Request Unibolt Positive Choke Bodies and Cage Nipples from Your Christmas Tree Supplier. Builds a Better Sucker Rod. Let Rubber take the Wear in Your Sucker Rod Pumps. Dope 'Em Right.

" 'Whatever they're talking about,' Lee says admiringly of the companies advertising, 'their secrets are safe with me.' "

In addition to giving us a laugh this clipping gives us an opportunity for a lecture. Subject: Communication, effective means of.

One of the basic rules of writing or speaking is to think in terms of your reader or listener, to use his vocabulary, and to leave him with no mental questions unanswered.

A subsidiary rule is that technical expressions are shorthand to people who speak that language but Greek to people who don't.

Now those Oil and Gas Journal advertisers who were quoted were doing exactly right. They weren't trying to sell anything to "the Denver Post's Lee Olson," nor were they trying to keep secrets from him or even to amuse him.

The people they aimed those ads at know exactly what is meant by welding a shoe or keeping a joint from jumping. Their technical shorthand served its purpose perfectly.

But suppose you, an oil man, undertake to explain something about the oil business to this same Lee Olson, or the Old Lady from Dubuque, or a congressman from New England.

Are you sure you could break the vocabulary habits of a lifetime and talk in terms the guy could understand?

We have a suspicion that a good deal of the oil industry's frustration in its public-relations efforts stems from its inability to speak any language but its own.

We have seen alleged explanations of the depletion allowance, conservation problems, and similar industry matters that would be a "list of incomprehensibles" to the average man in the street. He would really "need a road map 14,000 ft. down."

There is no communication unless your ideas get into the mind of the person you are trying to reach. And words that will penetrate one mind will bounce off another.

What may be clear as crystal to you may be clear as a "mud program" to a person who would be horrified at the thought of hanging a "choke body" on his tree at Christmas time.

So the next time you undertake to explain something to a non-oil-type person, be sure to "dope 'em right."

—Henry D. Ralph

VOTE FOR

the Winning Ticket!

Warren QUALITY X
Warren QUANTITY X
Warren SERVICE X

FOR
DEPENDABLE
DELIVERIES OF

Natural Gasoline

WHATEVER THE GRADE, WHATEVER THE VOLUME

WHEN, WHERE and the WAY You want it!

WARREN

PETROLEUM CORPORATION

TULSA, OKLAHOMA

EXPORT TERMINALS: CORPUS CHRISTI, PORT ARTHUR, BAYTOWN, TEXAS CITY AND WARRENGAS, HOUSTON, TEXAS, SAN PEDRO, CALIF.

Cuba's refinery seizures flout international law

CUBA'S SEIZURE of foreign-owned oil refineries was induced by emotionalism, impulse, and desperation.

It should be analyzed and answered by calm reasoning and objective recital of facts, obligations, and the realities of the modern world.

Cuba, like any sovereign nation, has the right to shape its own destiny and set its own oil policy. The question is whether Cuba's methods are a wise pattern for other nations, or even for Cuba. The desired objective might have been achieved by methods less drastic and upsetting.

THE TROUBLE STEMS from Cuba's desire to improve her foreign-exchange position by bartering surplus sugar for Russian crude oil. There is nothing wrong with that.

Many countries have bought Russian oil. But Cuba seems to have swallowed a larger quantity than she can digest in one gulp in view of the technical, legal, and commercial complications involved.

Quite possibly the American and British-Dutch refiners might have cooperated in helping to get reasonable quantities of Russian crude refined, if they had been properly approached and if the Cuban Government had cooperated with them in working out of their contracts to buy Venezuelan crude.

Instead, Premier Castro used threats, intimidation, blackmail, and invective—methods which civilized peoples deplore whether in diplomatic, commercial, or personal relationships. He denied them the foreign exchange to pay for Venezuelan crude they had already imported and used. He told them they had to ignore their existing supply contracts.

The refining companies refused, even though they knew this would mean confiscation and ouster. In this they acted properly. They were defending the principles on which commercial structures, economic progress, and the laws of nations are founded.

International oil operations, like all human endeavor, must rest on rules of law, not whims of men. There must be mutual respect and understanding, fair dealing, sanctity of contract, and patient renegotiation and adjustment of obligations when conditions call for a change.

OUR GOVERNMENT should be calm in dealing with emotion-charged situations like that in Cuba. But it should be completely firm in insisting on adherence to the rules of international law: Obligation to respect commitments, and compensation for confiscation or impairment of lawful property or rights.

This is by no means what once was termed "oil imperialism," or "big-stick diplomacy." It is simply adherence to principles and policies that must control both domestic and foreign relationships.

Each nation may formulate the oil policy it believes best for itself. But in so doing it must follow the conventions of society by respecting the obligations of itself and of other parties concerned.

How premium blend stocks perform on the road

Recent work by Ethyl Research pinpoints effects of component concentration and component boiling range on road performance

by **E. J. FORSTER,**
Refinery Technology Division, Ethyl Research Laboratories, Detroit, Michigan

THIS recent study, conducted by Ethyl Research for a specific refiner, produced two broad conclusions on the performance of premium gasoline components which are of interest to the entire refining industry:

1. Gains in Research octane number that are achieved through increasing the severity of catalytic reforming are not fully realized in terms of antiknock performance on the road.

2. When catalytic reformate is split and the bottom cut of the reformate is blended to premium gasoline, the wider the boiling range of the bottom cut, the better the road performance of the fuel relative to its Research octane number.

Ethyl Research was able to predict accurately the results of the study because increasing reforming severity also means increasing the aromatic content and, therefore, the fuel sensitivity (Research octane number minus Motor octane number).

Why These Conclusions Are Important

Efficient use of high octane blending stocks is very important to the refiner because of the octane improvement costs of current premium gasolines.

Optimum antiknock quality must represent an economic balance between both Research octane and Road octane. This must be continually reviewed because of the alternate methods for octane improvement available to the refiner.

For example, one alternate is splitting certain stocks such as catalytically cracked naphtha and reformate. Fractionation facilities are best used for this purpose when the optimum boiling range to blend for road performance is known.

Similarly, it is helpful to know the effect of increased reforming severity upon road performance, the effect of the addition of alkylate upon road performance, the effect of boiling range of catalytic naphtha and other factors that affect premium quality.

Ethyl's Test Program

Twenty-seven test blends were designed from base stocks shown in the opposite table to study various effects of base stock concentrations, reforming severity, and boiling range. Sixteen blends were composed of combinations of various catalytic naphthas and reformates. From these, two blends were selected because of their respective superiority with regard to either Road octane number or depreciation. Various percentages of alkylate, straight-run or polymer then were added to each of these reformate-naphtha base blends. Blends were leaded to a concentration of 3.0 ml TEL/gallon and butane was used to pressure blends to 10.0 lb. Reid vapor pressure.

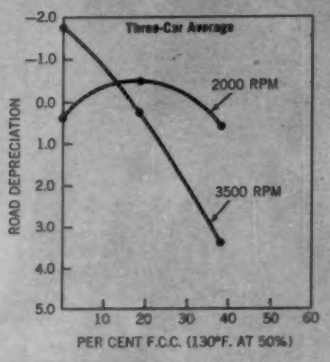
Both Modified Uniontown and Borderline road ratings were conducted in three passenger cars.

1959 VEHICLE	COMP. RATIO
A	11.1-1
B	10.7-1
C	10.1-1

BASE STOCKS USED AS COMPONENTS IN TEST BLENDS

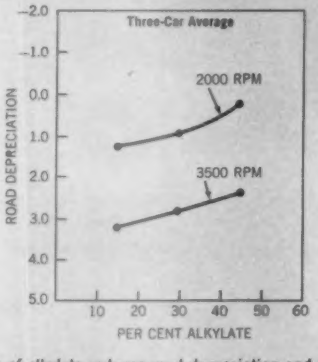
1. F.B. (Full-boiling) Cat Reformate (100 RON @ 3.0 ml TEL)
2. Heavy Cat Reformate (30% Bottoms, F.B. = 100 RON @ 3.0 ml)
3. Heavy Cat Reformate (70% Bottoms, F.B. = 100 RON @ 3.0 ml)
4. Heavy Cat Reformate (30% Bottoms, F.B. = 102 RON @ 3.0 ml)
5. Heavy Cat Reformate (70% Bottoms, F.B. = 102 RON @ 3.0 ml)
6. Light F.C.C. Naphtha (50% Evaporated @ 130°F)
7. Light F.C.C. Naphtha (50% Evaporated @ 180°F)
8. Full-boiling Alkylate
9. Light Straight-run
10. Catalytic Polymer

Effect of 130° Cat Naphtha on the Road Depreciation of Full-Boiling 100 RON Reformate



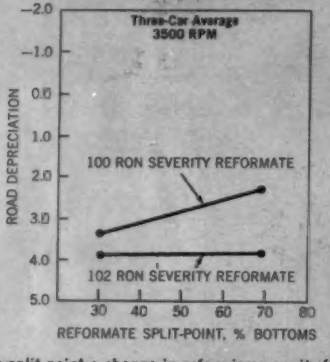
Up to 20% cat naphtha raised the low-speed (2,000 RPM) Road octane performance and consequently reduced depreciation (Research octane minus Road octane). At high engine speeds, the presence of cat naphtha in any amount results in depreciation which increases as the percentage of naphtha increases.

Effect of Alkylate on Road Depreciation
Base Blend Composition:
40% 180° F.C.C., 60%-30% Bottoms 102 Ref.



The addition of alkylate reduces road depreciation and thereby emphasizes the important effect of sensitivity on road performance.

Effect of Reformate Boiling Range and Severity on High Speed Road Depreciation



At any given split-point a change in reforming severity from 100 to 102 RON results in greater depreciation at high speeds.

How Ethyl Research works for you

Ethyl Research Laboratories in Detroit are continually investigating the variables that affect gasoline performance. Frequently, special studies are made for individual customers that are of interest to the entire industry.

An example is the new research report, "Road Antiknock Behavior of Premium Blends." This is available through your Ethyl Representative or send your request to: Ethyl Corporation, 100 Park Avenue, New York 17, New York.

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SEIZED by Castro was this Santiago de Cuba refinery of Texaco Inc. It is one of three taken over by Cuban militia.

Oil Won't Be a Big Problem for Cuba

• There are plenty of tankers available to Russia. State Department study indicates there's plenty of catalyst and trained help, and yields won't be too out of line. This is one factor in a new get-tougher policy of the U. S.

ONLY the days ahead will tell for sure, but the first faint signs have appeared that Cuba will get crude to operate its refining industry and that the seized plants may eventually be given back to their owners.

Oil men close to the Cuban crisis give this supply estimate: The Castro regime may be able to make present supplies of products last until more Russian crude can arrive to run the plants.

One Venezuelan official also expressed the opinion Cuba's action is an "intervention" rather than an "expropriation." On this basis the plants may be returned to their owners when causes behind the seizure are removed.

New oil fleet . . . Cuban officials, meanwhile, continue to boast they will get away with the seizure.

Alfonzo Gutierrez, the Mexican engineer who heads the Cuban Petroleum Institute, says 18 tankers are enroute to Cuba with Russian crude from Black Sea ports.

He estimates there are 8 to 10 days of crude stocks on hand. Other inventories: 59 days supply of gasoline, 45 days of aviation gasoline, 67 days of kerosine, and 27 days of fuel oil, essential to keep the country's power plants operating.

Oil men consider these figures on the high side but still believe Cuba will be able to squeeze by until supplies start arriving on a regular basis from Russia.

Cuban Premier Fidel Castro confiscated Esso Standard's 36,500-bbl. Belot refinery and Cia. Shell de Cuba's 27,000-bbl. Havana refinery 2 days after taking over Texaco's 20,000 bbl. plant at Santiago de Cuba.

Grounds were the companies refused to process Russian crude. The Esso refinery closed the day after the seizure because of a lack of supplies. Shell and Texaco plants continue to operate on a reduced basis.

Both the U. S. and British governments issued strong protests. The U. S. called the seizure of the Esso and Texaco refineries illegal, arbitrary, and inequitable. President Eisenhower promptly ordered a heavy cut in sugar-import quotas. The British demanded the return of the Shell refinery.

Cuban militiamen, meanwhile, occupy the offices, tank farms, and terminals of the three companies throughout Cuba. Refineries are under constant guard, and Russian technicians are already in Cuba to help keep the plants in operation.

The parent companies, Jersey Standard, Royal Dutch-Shell, and Texaco, hit back where they could by putting the government airline—Cubana Airlines—on a cash basis for fuel at foreign airports. The airline is reducing its passenger loads on flights to New York and Miami in order to carry fuel for the round trip.

Logistics question . . . There is little doubt about Russia's ability to deliver the oil or to obtain needed tankers.

The equivalent of about 26 T-2 wartime tankers plying between the Black Sea and Cuba could deliver 66,000

ALSO SEIZED was this 28,500-bbl. refinery of Cia. Petrolera Shell de Cuba, S.A., in Havana.

bbl. daily of crude on a year-in year-out basis with little trouble. Cuban demand has been averaging from 60,000 to 65,000 bbl. daily.

It is about 6,000 miles from the Black Sea to Cuba, and the round trip takes about 40 days, including turn-around time. Russia has about 90 tankers of its own and it is chartering ships from Greek and other owners.

With almost 500 tankers either laid up or idle, Russia is encountering little trouble making deals for tonnage. While the new contracts may not call for shipments directly to Cuba, they will enable the Soviets to divert all the ships necessary to take oil to Cuban refineries.

Stavros Niarchos shipping interests have confirmed they hold a contract with Russia to carry 2 million tons of oil, about 14 million barrels, to Japan and Europe over a 2½-year period starting in August. Niarchos denies that any of his vessels will be used directly in the Russia-Cuba trade.

A 19,500-ton Red Chinese tanker "Peking," on its way to Cuba with 140,000 bbl. of Russian oil, last week was damaged in a collision in the Mediterranean Sea off Tunis. This ship continued on its way despite a damaged bow. The other vessel involved was a Norwegian freighter, taken under tow.

Cuba says the first of the 18 tankers rushing oil from the Black Sea—the 26,800-ton Italian vessel Giuseppe Giuliette—would arrive July 13 with 200,000 bbl.

Other sources . . . There is speculation whether Venezuela or Mexico will sell supplies to Cuba.

Ernesto Guevara, president of the National Bank, indicated Cuba will seek oil supplies directly from the Venezuela government rather than from companies.

The Venezuelan government frowned on Cuba's initial agreement for Russian oil as a threat to one of its traditional markets. But Dr. Juan Perez Alfonzo, Venezuelan minister of mines and hydrocarbons, following Cuba's seizure of the Texaco refinery, said that Venezuela might not be opposed to selling oil to Cuba if the Russians fail to come through.

He said he considered the Castro move an "intervention" rather than an "expropriation" and indicated the Castro government might return the plant to its owners if the causes behind the take-over are cleaned up.

There are also reports that Cuba will seek crude from Mexico. The U. S. Government is expected to oppose any such purchase as strongly as possible.

Jersey statement . . . Esso, like Shell and Texaco, refused to take 11,000 bbl. daily of Russian oil despite a package offer by Castro to work off the foreign exchange debt in return for handling the Russian oil.

Jersey Standard said in a statement that more than $26 million is owed to the suppliers of Essosa, its affiliate in Cuba, over half of it for deliveries made last year.

The Cuban government informed

Freer flow of refining data seen

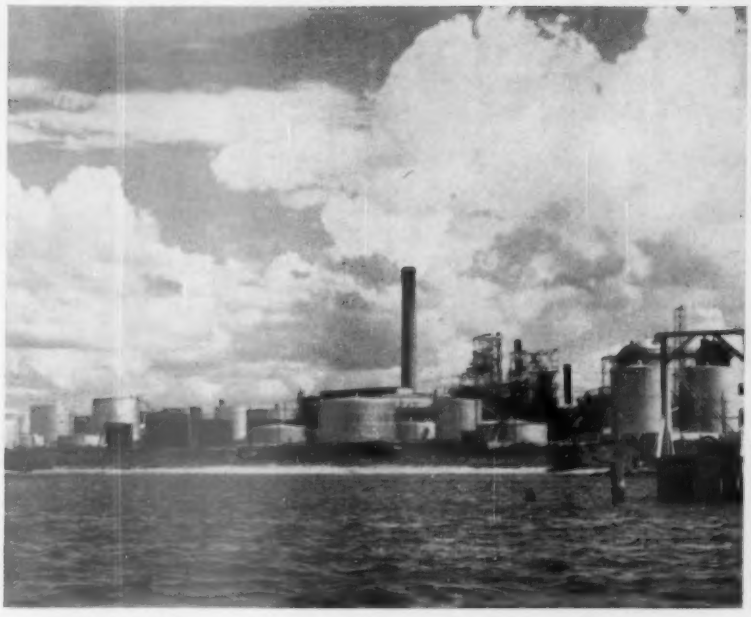
CUBA'S seizure of refineries may cause the U. S. to lift its ban on export of technical refinery data to Iron Curtain countries.

The reason is that some of this information already is in the hands of the Russians—or soon will be. For example, the Texaco refinery in Cuba includes a Unifining unit for feed preparation, a Hydrotreating unit for production of high-quality middle distillates, and other processes which have been on the U. S. Commerce Department's restricted list. They were installed by Procon, Inc., a subsidiary of Universal Oil Products Co.

It is known that UOP and others have in the past made applications for exporting some of the technical data but have abided by the Government's request not to do so.

A UOP spokesman explained that the original applications were not made through any eagerness to do business with communist countries. But, he said, Western Europe has no such bans, and this has weakened the U. S. companies' competitive position.

This position is obviously further weakened now by Russian access to much of the classified information.



BELOT refinery of Esso Standard, also taken over by Castro.

Essosa in April that foreign exchange for current shipments would be made available within 90 days of arrival. But of the $26 million now owed to suppliers, $4 million has accrued since the government promised to go on a 90 day basis.

"In view of this situation," said Jersey, "Essosa recently was informed by Creole Petroleum that the latter felt unable to continue sending crude oil to Essosa's refinery in Havana except for payment in advance. Inasmuch as the government will not sell exchange to Essosa for pesos the company is unable to offer such advance payment. Thus on purely economic grounds, Essosa was forced to suspend imports of crude oil with which to keep its refinery running."

Jersey denied that an old law specifies companies must refine all government-owned crude.

It said: "The law cited by the government as requiring that refineries in Cuba give preference to the oil of the government when read in its full context refers clearly to oil produced in Cuba itself if oil were to be discovered there in commercial quantities—not to oil imported by the government."

The parent company pointed out that Essosa in the past few years has invested $30 million in modernizing its refinery and expanding capacity from 9,000 to 35,000 bbl. This investment was made in expectation of continuing freedom to select sources of imports. "It was certainly not made with any thought that the company would be forced to buy crude oil from Russia for running through its equipment."

Canadian Shell, parent company of Cia Petrolera Shell de Cuba, expressed "its deep regret that the management of its affairs in Cuba has now passed out of its hands."

Shell said the government's intervention presumably was a reprisal for Shell de Venezuela's decision to stop supplies. This action was taken as a result of nonpayment of a debt of approximately $17 million.

Cuba's Oil Outlook Shapes a Tougher Policy

THE U. S. policy of patience toward Cuba's Fidel Castro appears to be nearing an end.

Present planning in the U. S. State Department and administration circles is to quit turning the other cheek and start talking cold turkey.

As a result, President Eisenhower's cut in sugar quotas is expected to be only the first in a series of developments. These will have two basic aims:

. . . **To apply** economic pressure to Cuba.

. . . **To help solidify** public opinion against Castro in other Latin American countries.

The U. S. feeling is that if the weight of opinion of other Latin American nations can be brought to bear against Cuba, Castro will be in a difficult position.

A state department official put it this way:

"If we can rally Latin American public opinion, then Castro will no longer be able to try to blame 'yankee imperialists.'"

A limit to patience . . . This official justified the previous "go slow" policy the U. S. has followed on the grounds that any other action might have created sympathy for Castro. But, he said, there is a limit to the policy of patience.

An indication of the new course the U. S. plans to take was shown last week in the toughness of the language of a note sent to Cuba protesting the seizure of the refineries.

For example, the note called the refinery seizures further confirmation of "a pattern of relentless economic aggression by the Government of Cuba against the United States and other countries."

Those familiar with diplomatic language say this could set the stage for action by the Organization of American States since economic aggression is specifically prohibited by the Inter-American charter.

No oil shortage . . . The move to a tougher policy apparently was influenced, too, by a conclusion at the State Department that it would only be wishful thinking to sit back and wait for Cuba's refinery operations to collapse.

That is, State Department officials felt, after considerable study, that Cuba will be able to keep the refineries in operation and that there are not likely to be any petroleum shortages in Cuba.

They reached these conclusions after talking with oil experts on such topics as tanker availability to move Russian crude, the supply of catalyst at the Cuban refineries, and the possible oversupply of residual fuel which might develop.

In each case, the oil experts advised the State Department that the Cubans—with the help of the Russians—probably would be able to cope with the problem.

That, in turn, caused the State Department to turn to other possible avenues of approach.

The U. S. Government's concern reaches beyond the Cuban situation itself. There is the fear in Washington that if this development goes unchallenged, other countries may try to follow the Cuban pattern.

Oil Will Face Problems in Late Session

• Current recess has changed legislative outlook. Both parties, with an eye on elections, will be performing for the voter when Congress reconvenes.

THE CURRENT congressional recess puts the outlook for some major legislation, including that affecting the oil and gas industry, in a different light.

For one thing, it provides more time for congressmen to press for action on bills that would have been doomed had Congress ended its year's work instead of taking the recess.

For another, when Congress does get back to work in August, it will be more subject to political maneuvers. For many congressmen, a decision on legislation so close to election will be based largely on how many votes it will win or lose when the November ballots are cast back home.

Too, the two major political parties will no doubt seek to outdo each other in the fall session to show which party will do the most for the voters.

Outlook for oil . . . Percentage depletion may become a big issue when Congress returns to Washington.

Those who claim that this tax provision is a "loophole" could hardly pick a better political climate for a renewed attack.

True, a recent move to cut percentage depletion was beaten down handily in the Senate. But that was on an effort to reduce the provision to 15%.

The next attempt probably will be directed by Sen. John Williams (R.-Del.), who is planning to press for a proposal to reduce the percentage to 22.5% and tie in with it an exemption for smaller producers and a cut in the top personal income tax brackets. Obviously, this would have a wider vote appeal than the earlier proposal.

Washington oil observers consider Williams a much more dangerous foe of depletion than some of the senators who annually attack the provision.

It may be, however, that neither partly will want to make percentage depletion an issue during the pre-election session of Congress.

Vice President Richard Nixon and Sen. Lyndon Johnson are known to favor continuation of the present rate. But neither is likely to take an aggressive lead in its defense.

Sen. John F. Kennedy, who has voted against a cut to 15% but who has voted for a graduated reduction, will probably be even less willing to see the issue become a major one.

Other probabilities . . . Aside from depletion, several other matters affecting oil directly or indirectly probably will crop up when congress gets back to work.

Esso Warns of Possible Resid Shortages

• IPAA counterattacks with charge Esso is promoting "misunderstanding" with "inaccurate" statements. Outlook: A real battle in weeks ahead.

THE Government's residual-fuel import-control program was attacked—and defended—anew last week.

The attacker was Esso Standard Oil Co. It sent letters to its heavy-fuel-oil customers warning them of possible shortages and blaming this situation on the control program.

Esso said there was an "extremely serious" threat of shortages before September 30, the end of the current 3-month allocation period. And Esso told its customers that "we are unable to assure you what quantities will be available past September."

Esso contends that the blame lies in a "substantial" gap between supply and demand created by the "low" allocations made by Interior Department officials for the current period.

IPAA takes issue . . . Esso's action drew a quick protest from Minor Jameson, executive vice president of the Independent Petroleum Association of America.

In a letter to IPAA members, Jameson said Esso was guilty of "inaccurate and incomplete statements" that "promote both misunderstanding of the Government's program and a lack of confidence in the industry."

Jameson classified as a half-truth an Esso reference that only half as much heavy fuel oil per day can be imported in the third quarter of this year as was allowed by the Government under the most recent allocations which covered the first 6 months.

Jameson said that such a comparison is unfair because "it ignores the fact that the third quarter is the period when the demand for residual fuel oil is substantially reduced.

Jameson also challenged an Esso complaint that the Government's effort to keep residual imports at 1957 levels fails to take into consideration the annual growth in demand.

"There has been no growth in consumer requirements (for residual fuel) in the past 10 years," Jameson said.

Esso Standard, in reply, said that while this is true for the nation as a whole, it is not true for the East Coast. Demand for resid has declined in the rest of the U. S., Esso said, but it has climbed on the East Coast from 700,000 bbl. per day in 1955 to 816,000 bbl. in 1959.

The decrease in imports, combined with a drop in domestic production, Esso insisted, will leave the East Coast short by about 100,000 bbl. a day.

Jameson concluded his letter with the charge that Esso Standard has rendered a disservice to the industry and the Government "by resorting to misleading statements which frighten the consuming public and create fears of a shortage of residual fuel oil."

Opening salvo . . . The Esso letter and the IPAA rejoinder are probably just the opening skirmishes of what is likely to be a full-scale battle over residual fuel by the time Interior has to decide on fourth-quarter quotas.

The Government will be under heavy pressure, particularly from the coal industry, to keep the lid on residual-fuel imports. But major importers, marketers, and some consumer groups will press for a big increase over third-quarter levels.

The consumer groups will be particularly active if there is any indication that a price hike for residual is in the making.

Current allocations—for the July-

# of Congress

... **The minimum wage law** will be changed, increasing the per-hour minimum and extending its coverage.

It is likely that independent marketers will be specifically exempt, but passage of the legislation still will have considerable impact.

... **The proposed fuels policy** study will get further consideration.

Undoubtedly, coal's bargaining position will be stronger this fall, with an election just around the corner.

... **Proposed changes** in federal leasing laws, affecting noncompetitive leasing of public lands, will win approval (OGJ, July 4, p. 65).

... **Revisions** in the Helium Act will be made, although it is not certain yet whether profits from helium extraction will have to be considered in fixing natural-gas rates.

Beyond that, it is anybody's guess as to what Congress may do when it returns to face the late-summer heat of Washington and the late-summer heat of politics in a presidential election year.

September period—are for 250,000 bbl. daily into Districts 1-4.

Interior import officials concede there may be a gap of around 20,000 bbl. daily between that level and expected demand. However, they point out that they have the authority to make monthly adjustments in the import levels if necessary.

They concede, too, that the allocations will have to be increased substantially for the fourth quarter.

Based on present estimates, it is likely that fourth-quarter quotas will be between 500,000 and 600,000 bbl.

It is a safe assumption that Interior will not deliberately create a residual-fuel shortage nor set the stage for a fuel price hike—especially not with a national election just ahead. However, it is not expected to change the third-quarter quotas unless it becomes convinced that such warnings as those made by Esso are well grounded.

It is to be remembered that Interior did increase quotas in April after it became clear that allocations for the first 6 months of the year would not be sufficient to meet demand. In doing so, however, Interior charged that some major importers were guilty of "irresponsible action" in bringing in the bulk of their 6-month quotas early in the year and selling some of the fuel oil at low prices.

watching WASHINGTON

Clyde La Motte

• Anything may happen when Congress reconvenes . . .

DON'T get caught napping when Congress reconvenes after its recess for the political conventions. It will be an unusual session, and unusual things may happen.

Politics will be dominant. This will set the stage for vote-getting legislation. And well-organized pressure groups will have a better opportunity to bargain for support for their pet projects. The most recent example of this was the pay boost voted for federal government employes.

There will be party platforms to live up to. Ordinarily, there is a lapse of 2 years after the promise-making at a convention before party members have to face the voters again. By then, convention promises have been forgotten, or the situation has changed.

This time, however, Congress will be back in session immediately after the convention platforms are adopted. So the pressure will be on to move toward those goals. This will be particularly true of the Democratic party, since it has a majority in Congress.

As usual, party platforms will be kept broad—and as vague as possible. Even so, congressmen will be under pressure to show some results.

It should be kept in mind, too, that the congressional recess has given a new lease on life for some proposed legislation which apparently had been pigeon-holed. One prime example of this is the resolution pushed by the coal industry to establish a congressional committee to make a study of the nation's fuels. This move, stymied in House rules committee, is sure to be tried again when Congress gets back to Washington in August.

• In an election, emphasis is on "voter appeal" . . .

ONE TREND that is becoming more apparent—particularly because this is an election year—is the swing back toward bigger government, more federal programs, more federal spending. This could have important ramifications for business and industry, including the oil industry.

There will be a new push for more public housing, more schools, medical care for the aged, more federal government support for this program and that.

Defense spending is on the rise again, promoted by congressional concern over the U-2 spy-plane incident, and the disaster of the President's planned visits to Russia and Japan.

All of this adds to pressure for greater government revenues. Yet, short of an all-out emergency, Congress will not hike personal income taxes. The burden, therefore, will fall elsewhere.

Such a setting creates a grave danger for percentage depletion. The big attack on depletion may not come during the post-convention session, although an effort will be made by depletion foes to bring it to a showdown while the drive for votes is on. But—this year or next—percentage depletion will again face a sharp challenge. And the industry had better be ready for it.

• Short session will be a proving ground . . .

ONE OTHER factor which should not be overlooked is the fact that the potential nominees for each party are members of Congress. That will put the spotlight more than ever on the post-convention seession of Congress.

For instance, suppose that Sen. John F. Kennedy is the Democratic selection. Obviously, there would be a strong effort by his party to push Kennedy measures through. This would demonstrate party unity and would demonstrate that Kennedy is a man who can get things done.

The same would be true, of course, if Sen. Lyndon Johnson were chosen as his party's standard bearer.

On the other side, the Republicans will be eager to embrace "popular" legislation, too, on the eve of the November election. Vice President Richard Nixon, sometimes charged with leaning toward business interests, will seek to demonstrate that this is not the case.

Texas-Mexico-California Line Studied

• Imaginative scheme calls for 1,100 miles of 34-in. pipe on an all-Mexican route. It would supply Southern California Edison and some Mexican plants.

THE determined effort of a California electric utility to obtain its own gas supply may bear fruit with a $200-million all-Mexican pipeline.

The project is reported to be a 1,100-mile 34-in. line from Laredo, Tex., across northern Mexico to Mexicali, on the California border.

Southern California Edison Co., Los Angeles, is understood to have firmed up an imaginative scheme involving Tennessee Gas Transmission Co., Houston-based transmission firm and integrated oil company; Petroleos Mexicanos, the Mexican Government oil agency; and several U. S. producers.

What's involved . . . Although the principals declined comment, industry sources in Houston, where the deal was "common knowledge," outlined it this way:

. . . Initial volume will be made up of 70,000,000 cu. ft. daily from South Texas fields and 125,000,000 cu. ft. daily from Mexico; 70,000,000 cu. ft. would be delivered to Mexican industries along the route.

. . . Eventual deliveries to California would be 450,000,000 cu. ft. daily.

. . . A gas swap would result in 70,000,000 cu. ft. daily from Bastian Bay field, South Louisiana, being delivered to the nearby Tennessee system for its eastern and midwestern U. S. markets. This gas, purchased by Edison from Pan American Petroleum Corp., would be exchanged for a like volume in South Texas for delivery at Laredo.

. . . The pipeline would be built by Tennessee, the middleman transporter, across Mexico, and the 200-mile section from Mexicali to Edison's Los Angeles area plants would be built by Edison.

. . . Completion would be in about 2 years, when Edison's supply contracts with transmission subsidiaries of Pacific Lighting Corp., Los Angeles, expire.

Earlier efforts . . . Edison, Tennessee, and Pan American have been reported on numerous occasions the past 2 years to be on the verge of making a deal.

One proposal which received wide currency in the industry was called Gulf Pacific Pipeline (OGJ, May 19, 1958, p. 101). There was testimony before the Federal Power Commission that Edison had offered 27 cents per M.c.f. for Bastian Bay gas, which would be the main supply for a line from Louisiana to California.

A second reported proposal also called for a Louisiana-Texas gas swap to reduce the pipeline distance. This would have been an all-U. S. line.

Still another private group recently offered Edison a big gas package from the Permian and San Juan basins of the Southwest. This was reportedly declined in favor of the Trans-Mexico project.

Edison has also studied liquefied methane from Venezuela as a means of obtaining a supply under its own control. This is too expensive.

The background . . . Edison has been dissatisfied for some time with its Pacific Lighting gas source which is interruptible in winter; space-heating demand cannot be met without reducing the industrial load.

Air - pollution - control restrictions, limiting the months during which fuel oil can be burned in steam-electric plants, have provided further impetus for an independent gas supply.

Edison has been served by Pacific Lighting under 5-year contracts, renewable annually; but these were understood not to have been renewed some 3 years ago. There has been no secret about the coolness between Pacific Lighting and Edison.

Tennessee, already the nation's largest gas-transmission company, is a major transporter to the populous Northeast. And during the past year it cracked the Chicago area market through its subsidiary, Midwestern Gas Transmission Co.

It would be a master stroke for Gardiner Symonds, the enterprising Tennessee president, to push into California, which has been described by Paul Kayser, chairman of El Paso Natural Gas Co., as the best gas market in the country.

El Paso was the sole out-of-state supplier for California until Transwestern Pipeline Co. completed its $193-million line from Texas which is now being readied for operation.

Pemex has sought in vain for an economic method of bringing gas to northern Mexico industries relatively remote from Mexican gas fields. Pemex approached El Paso to build a line from Arizona into Mexico, but found the price too high.

Pan American has long sought a buyer for its Bastian Bay reserves, among the largest on the Gulf Coast, preferably in an unregulated sale beyond the reach of the long arm of FPC. Whether such a direct sale as this will escape federal control remains to be seen, for it will provoke a good deal of head scratching among industry lawyers.

At any rate, the Mexican project seems to satisfy everybody—everybody except Pacific Lighting.

Battle ahead . . . If anything similar to this proposal is attempted, an interesting donnybrook is assured in California.

For Pacific Lighting will not take lightly the loss of its largest single load, the Edison plants. The interruptible load is considered necessary by the gas company to maintain a high load factor offsetting fluctuations in heating demand.

Without this load, Pacific Lighting says, the price of gas to residential customers would go up sharply.

The gas company maintains that the public interest is best served when it provides service to all types of customers. And thus far the gas company seems to have the backing of the California Public Utilities Commission, which claims jurisdiction over all gas pipelines in the state.

PIPELINE

A 73-mile 8-in. products line from Helena to Montgomery, Ala., is planned by Plantation Pipe Line Co. The new line will replace a 4-in. line to provide capacity for increased requirements in the Montgomery area. Capacity will be increased from 8,300 bbl. daily to 20,000 bbl. daily when the $2-million project is completed October 1. Surplus pumping equipment freed by installing the larger diameter will be placed on lines between LaGrange and Macon and LaGrange and Columbus in Georgia to increase capacity of those sections.

A total of 110 million cubic feet daily of natural gas will be processed by a gasoline plant to be built in Alberta by Pan American Petroleum Corp., Hudson's Bay Oil & Gas Co., Ltd., and Canadian Fina Oil, Ltd. The companies have committed a trillion

Pacific Lighting prevented Edison from building an intrastate gas line 3 years ago. It challenged Richfield Oil Corp.'s right to build a line to an Edison plant without a state certificate, but the California Supreme Court sided with Richfield. (See story p. 65).

This legal skirmish is still going, and Californians expect it to warm up considerably if the Mexican catalyst is introduced.

Butane Goes to Inland Storage from the East Coast by Pipeline

THE FIRST pipeline movement of butane from an East Coast refinery to an inland underground storage plant was completed last week by Atlantic Pipe Line Co.

Butane from Atlantic Refining Co.'s Philadelphia refinery was delivered into the Blair underground storage plant of Anchor Petroleum Co. at Bath, N. Y.

The 10,000 bbl. of butane was routed with other normal petroleum products for the 240-mile pipeline trip and was delivered into Anchor's salt cavern storage wells by pumping direct from the pipeline at the rate of about 1,000 bbl. per hour. Several additional shipments of butane by this route are expected to be made this month.

The butane, an excess refinery product at this time of the year, will be stored at Bath until needed by Atlantic at Philadelphia for gasoline blending during the winter months.

Texaco Strike Threat Ended

. . . as workers at Port Arthur give up most demands and settle for an increase in company medical contributions. The action may serve as a guide for eight other plants.

THE OIL, Chemical and Atomic Workers Union receded from most of its demands at Texaco's Port Arthur refinery last week and accepted a company contract offer for an increase in medical contributions.

The union action ended a strike threat at Port Arthur and is expected to serve as a guide for eight other Texaco plants in the nation. Of the 10,000 Texaco workers represented by OCAW, 4,200 are at Port Arthur.

Approval of the new contract does not end union negotiations, however. The issue of higher wages will be negotiated separately, and the Port Arthur OCAW local expects to follow the national bargaining committee's recommendation for an 18-cent increase.

The settlement . . . The newly approved working agreement provides that the company's monthly contribution for hospitalization, medical, and surgical plans shall be raised from $1.32 to $1.50 for a person with no dependents. The union had asked for $2.50 (no dependents), $5 (one dependent), and $7.50 (more than one dependent).

The union decided against pushing for two other demands: Higher earlier retirement pay and a ban on contract maintenance work by the refinery (OGJ, July 4, p. 64).

The company agreed to grant separate sick leave and accident leave in the new contract. Heretofore, the 13 weeks of full-pay leave was granted for sickness and accidents combined. Under the new plan, a person could be sick 13 weeks at full pay and then, after returning to work and suffering an accident, get another 13 weeks of accident leave at full pay.

Approval of the contract last week also eased the threat of a sympathy strike at Texaco for the striking OCAW workers at the Jefferson Chemical Co. plant at nearby Port Neches. The Port Arthur refinery has been furnishing feed stocks for the Port Neches plant, which is being operated by supervisory employes.

A union spokesman said last week there is some question of the legality of such a strike by Texaco workers but that, if it were called, it probably would be for another reason—such as a breakdown in contract negotiations.

With the approval of the contract, this excuse would no longer exist. However, negotiations for higher wages may provide another.

BRIEFS . . .

cubic feet of gas from Windfall, Pine Creek, and Beaver Creek fields, located 25 to 50 miles north of Edson, to Alberta & Southern Gas Co., Ltd. The pipeline will be completed next year. The plant, which also will have facilities to recover 650 long tons of sulfur daily, will be started this year.

Construction will start this week on a 22-mile 8-in. crude line in Alaska from the Swanson River unit to the Nikishi terminal, on Cook Inlet. The $4-million project, being built by Standard Oil Co. of California, has been contracted to Sharman, Allen, Gay & Taylor, Inc. Completion is planned for mid-1961.

A 20-mile 18-in. submarine pipeline will be laid in the Persian Gulf by BP Trading, Ltd., to link a crude-oil collecting platform to Das Island, where separators, storage tanks, and a tanker-loading jetty will be built. Producing wells in the new offshore field 60 miles from the Arabian coast will be connected by 6 or 8-in. pipelines. The discovery is on the concession of Abu Dhabi Marine Areas, Ltd., owned two-thirds by BP and one-third by C.F.P.

Some $75 million in construction has been let by subsidiaries of Peoples Gas Light & Coke Co., Chicago, following approval by the Federal Power Commission. Contractors for Natural Gas Pipeline Co. of America for 136 miles of 36-in. and 188 miles of 24-in. are River Construction Corp., O. R. Burden Construction Corp., R. H. Fulton & Co. Contractors for 371 miles of 30-in. for Peoples Gulf Coast Natural Gas Pipeline Co. are Stanley-Bledsoe Corp., O. R. Burden, H. C. Price Co., River Construction, Panama-Williams Corp., and Sharman, Allen, Gay & Taylor.

Also for Pipeliners . . .

IN THE NEWS: Big-inch line with a Mexican route is under consideration for moving Texas gas to a California utility (p. 62) . . . Atlantic Pipe Line will move butane from East Coast to inland underground storage of Anchor Petroleum (p. 63) . . . Midwestern lets contracts for line from Canada to upper Middle West (p. 72) . . . Westcoast Transmission says it will loop its entire big-inch line (p. 73).

PLUS THIS TECHNICAL REPORT: Pressure welding for pipelines achieves good girth welds but has several disadvantages (p. 114).

Liquid CO_2 Will Serve Permian Basin Floods

- **Central liquefaction, fleet of special tank trucks eliminate need for a plant at every project.**

A NEW COMPANY has been formed to supply carbon dioxide to West Texas licensees of the ORCO process.

The new firm, West Texas CO_2 Co., formed by Oil Recovery Corp. and Helmerich & Payne, Inc., will build and operate a CO_2 liquefaction plant in Pecos County. Raw material for the plant will come from gas now being vented from the Permian Basin Pipeline Co. CO_2-removal plant in Puckett Ellenburger field.

Being built at a cost of a half million dollars, the liquefaction plant will initially process about 3 M.M.c.f. of CO_2 per day. Engineering on the plant will permit later expansion so that all of the 40 M.M.c.f. of gas now being vented daily from Permian Basin's plant can be handled.

To ease transportation . . . Early ORCO projects used CO_2 that was generated at the injection site. Under this plan, each field using the ORCO process would have to have its own generating plant, or would have to have one nearby, within reasonable pipeline distance.

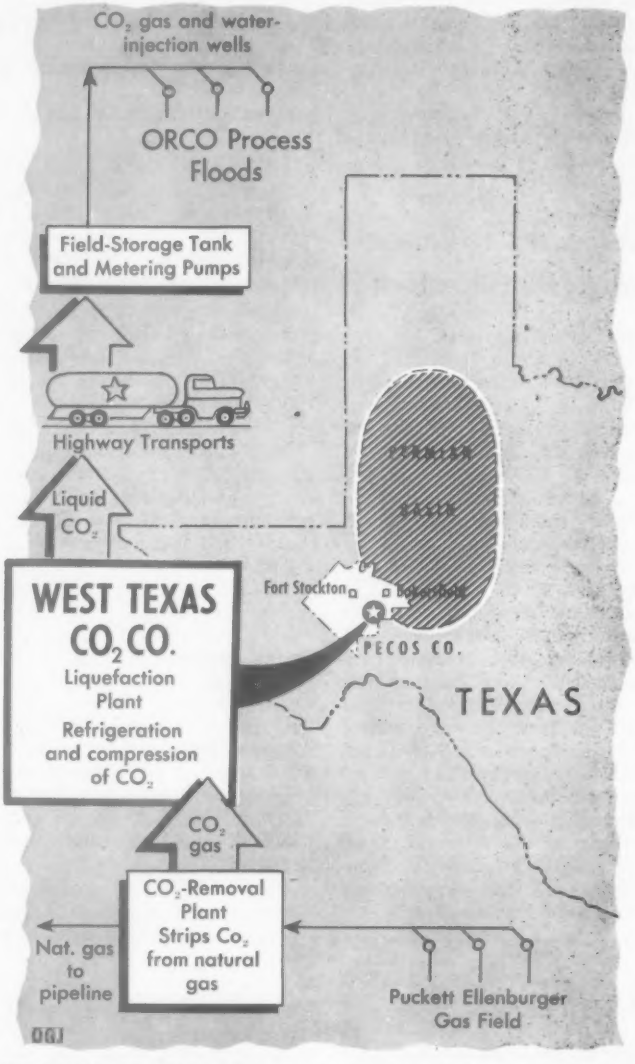
Liquefying the gas eliminates this problem, and puts the entire Permian basin within the operating radius of the plant.

West Texas CO_2 Co. will operate a fleet of highway transports, each capable of delivering 20 tons of liquid CO_2 in insulated high-tensile-steel trailers. Development of this high-tensile material within the past year has made the 20-ton payload possible by lightening the tank trailer. Without these new steels, the permissible payload would be of the order of 15 tons.

These trailer trucks can maintain the liquid at the required 0° F. temperature and 325-psi. pressure to prevent vaporization. Local storage at the injection site will be in the liquid state, with vaporization occurring at the time of injection.

Lee Bentley, of Oil Recovery Corp., and Harry Saye, of H&P, spokesmen for West Texas CO_2 Co., said that the plant capacity and the truck fleet can easily grow to meet the demand, and that the entire Permian basin is within the operating radius of the plant.

They also point out that the company may transport CO_2 gas by pipeline to terminal points nearer the oil fields to the north.



LIQUEFACTION PLANT will be built in Puckett field to take advantage of CO_2 now being flared from Phillips gas-processing plant. Tank trucks give the product a wide distribution area.

Engineering completed . . . Contracts for the engineering of the plant were awarded last winter. Design is now complete and the equipment is on order. Construction contracts will be awarded sometime in July and the plant will go on stream in October.

Reason for the rush to complete the plant is that one customer has already signed up, and part of the plant's production is committed for the next 3 years. But, plant operators were quick to point out that there is plenty for everybody, as the Puckett Ellenburger source seems to be inexhaustible. (Puckett Ellenburger gas contains 28% CO_2.)

Phillips gains . . . Although the "waste" CO_2 is on the downstream side of Permian Basin's removal plant, title to the gas was retained by Phillips Petroleum Co. Completion of the new liquefaction plant will mean a profit to Phillips.

It will also mean that one natural resource will be used as a means of producing another.

Louisiana Votes in Compulsory Unitization

• Units can be ordered by the conservation commissioner upon approval by 75% of operators and royalty owners. Bill awaits only Davis' signature.

LOUISIANA apparently is going to get a long-needed unitization law for oil producers.

A bill requiring only the governor's signature has passed the Louisiana house and senate and provides that the conservation commissioner can order an oil pool unitized if owners of three-fourths of the land and three-fourths of the oil production give their approval.

In the past, oil unitization has been on a voluntary basis only.

The compulsory gas-unitization law is not affected by the bill. However, another bill liberalizing the gas law was sent to the governor for signature. It permits the conservation commissioner to vary the location of a secondary-recovery operation to any point in the pool unit.

Under the present gas-unitization law, the commissioner must establish the project within a prescribed distance of the center of the unit.

The oil unitization bill was watered down considerably before it finally won passage by the two houses. It was drawn originally to provide for two-thirds approval of the landowners and producers, but the house amended this to three-fourths.

Also the bill originally provided for field-wide unitization, but this was changed by the house to one producing structure—a pool.

When finally passed, opposition to the bill had dwindled considerably because of the amendments. It will take effect 30 days after approval by Gov. Jimmie Davis. The governor's signature is expected by the industry.

Sens. A. C. Clemons, Jennings, and Guy Sockrider, Lake Charles, are authors of the bill.

Other legislation . . . Earlier in the current session, the legislature reenacted the 2.3-cent gas severance tax at Gov. Davis' request.

Except for the gas tax and the unitization bill, there was little oil legislation of importance before the Louisiana session, which closed last week.

A resolution calling for an investigation of "irregularities" in the conservation department and the state mineral board was defeated in the house by a single vote. Support for the resolution was sparked by Leander H. Perez, a local political leader at odds with William G. Helis, mineral board chairman, and Atty. Gen. Jack Gremillion.

Another piece of legislation affecting the industry also was killed. It would have provided fines of up to $100,000 for companies responsible for water pollution, regardless of how the pollution occurred.

Personnel . . . With the legislature leaving for home, Gov. Davis is expected to act shortly on important oil appointments.

Helis is reported in line for reappointment as chairman of the mineral board unless he tells Davis he wants to quit.

Ashton Mouton, conservation commissioner, is expected to be replaced by Charles Mayer, a Shreveport attorney, according to industry sources.

Richfield Escapes Utility-Type Controls

• California Supreme Court says that selling gas under contract to a single customer does not mean a producer should be controlled as a utility company.

THE California oil industry is breathing a little easier now that the California Supreme Court has ruled Richfield Oil Corp. is free of utility-type regulation.

Richfield has been involved in a court fight with Southern Counties Gas Co. and the state's public-utilities commission over the sale of gas to Southern California Edison Co. Southern Counties has contended Richfield should be controlled as a utility for selling gas to the electric company. The PUC agreed.

But the California Supreme Court ruled otherwise. The high court says there is no basis for Richfield's coming under the utilities commission.

Only Richfield's gas operations were being questioned, but oil men feared bringing the gas operations under PUC control would lead to control of all oil and gas operations.

The court's view . . . The supreme court recognized the far-reaching effects of any decision that Richfield should come under PUC control.

"It would subject every oil and gas producer that has sold or proposes to sell gas for light, heat, or power or for resale to the public to the jurisdiction of the commission," it said.

The court also pointed out the administrative headaches involved in segregating gas operations from oil operations and keeping tab on what would come under regulation had the court ruled against Richfield.

Going even further in this line of thinking, the court pointed out only certain portions of a gas producer's gas would come under regulation. Any gas used for petrochemical production or pressure maintenance would escape regulation.

"Regulation dependent on how the producer disposed of his gas might stimulate less desirable unregulated uses at the expense of more desirable regulated uses," the court said.

The court's decision left the door open for future regulation, but it placed the responsibility of developing such regulations with the state legislature.

What started fight . . . Richfield has signed a contract to supply Southern California Edison with 500 billion cubic feet of gas over the next 25 years.

Southern Counties Gas claimed the contract invaded its territory and that the operation should be controlled by the PUC. Richfield built a 58-mile 20-in. line to feed gas from the Cuyama Valley and San Joaquin Valley fields to Edison's Mandalay plant. An 8-mile 6-in. line from from Richfield's artificial island off Rincon has been connected to the 58-mile line.

An attempt was made to block construction and operation of the two lines, but Richfield received court approval to continue operations until the case was heard by the state supreme court.

DUST is a major drilling problem in New Mexico's Empire Abo field, especially in Pan American's air-drill operations.

PLANS for field processing plant in Empire Abo are inspected by Pan Am's G. C. Hickman and Jack Brown.

Abo Reef: Southwest's Hottest Area

• Drilling hums in southeastern New Mexico where operators hunt for prolific oil trend: The payout is excellent for those who've already hit.

THE story of the Abo reef trend drilling in southwestern New Mexico is just beginning. It's one of feverish activity to get in on excellent returns awaiting the successful.

Hunt for the reef has turned Eddy and Lea counties into two of the nation's hottest drilling spots. In early June Eddy County had 29 rigs running and Lea County reported 36. These increased to 31 in Eddy and 37 in Lea later in the month.

The oil-producing reef underlies these two counties like a huge buried snake, and reaches eastward into Texas. It lies along the northern edge of the Delaware basin and is located above the Wolfcamp formation and below the Yeso.

Prime target . . . Within the last 6 months Abo reef formation has become a prime target of operators over this wide and desolate stretch of country southeast of Artesia.

This development has occurred nearly 9 years after the initial Abo reef discovery.

This strike was in December 1951 in Lovington field southeast of the town of Lovington. Production was confined to this field until 1958 when the Empire Abo pool was found by Pan American Petroleum Co. in Eddy County, 50 miles west of Lovington.

Abo reef exploration hit a feverish pitch early this year with completion of Carper 1-A Federal between the two earlier producing areas. The Carper well is in Lea County, 22 miles west of Lovington and 28 miles east of Empire Abo. Wildcatting is continuing with limits of the reef trend still undefined.

Depths of Abo formation run from about 4,500 to 8,300 ft. with reef sections ranging in thickness from 850 ft. in Empire to 1,000 ft. in Lovington. Reserves range from 10,000 bbl. per acre in Empire to 25,000 bbl. per acre or more in Lovington. Empire wells cost from $85,000 to $100,000 while those in Lovington run to $140,000.

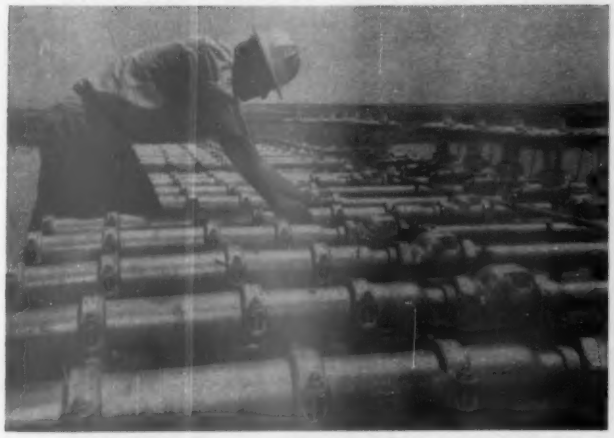
There have been few drilling problems, with completions simple and natural after a small mud-acid treatment. The wells are completed flowing.

Busy operator . . . Pan American, the pioneer in Empire Abo, keeps four rigs busy under turnkey contracts and now has 80 wells in the field capable of producing from 50 to 100 bbl. an hour.

With present allowables set at 60 bbl. daily, company production in the field is running about 5,000 bbl. daily.

Pan American is putting in the latest automatic lease equipment to handle, test, and measure the oil from well to pipeline. The company and other operators also are building a field processing plant to strip liquid hydrocarbons from the natural gas present in producing formation. Initial plant capacity will be 10 million cubic feet with provisions for future expansion.

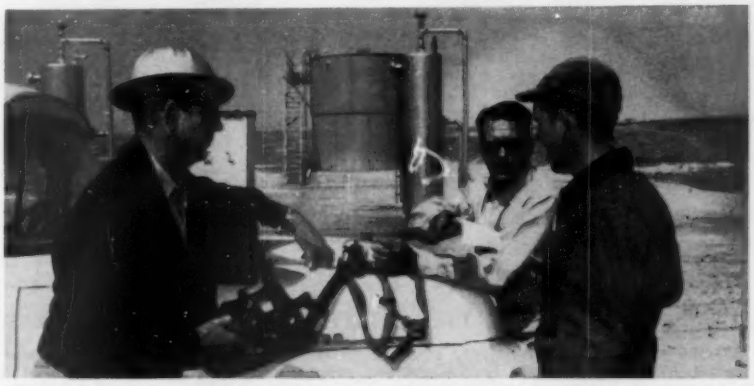
Pan American engineers expect the company to remain in the Abo reef play a long time, producing present reserves and adding more from untested leases on the northern trend.



AUTOMATIC equipment is very much in evidence as Pan Am Pumper H. E. Scribner tests one of 27 producing wells hooked into this Empire Abo lease storage unit.

DAILY RUN of crude to pipeline is checked by Foreman T. J. Thigpen as Scribner looks on. This LACT unit alone has run 208,000 bbl. of oil to pipeline since December.

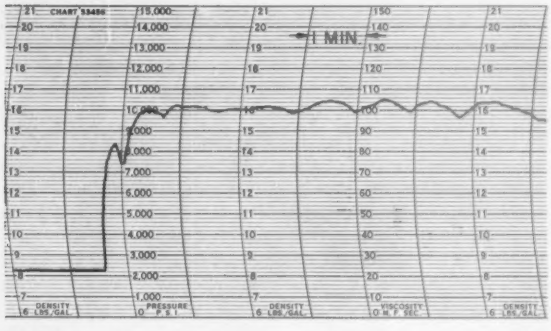
Pan American, a pioneer at Empire Abo field, puts in the latest automatic production equipment and field processing plant with an eye to staying long time.



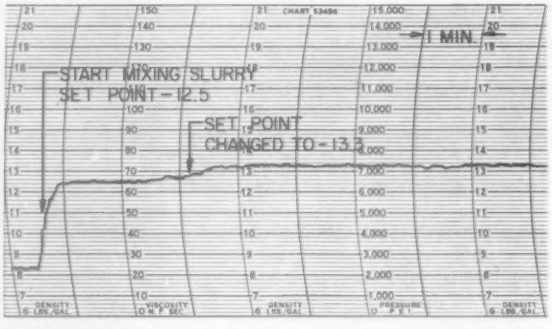
SOUR GAS is a constant hazard in Empire Abo operations. Pan Am Safety Expert J. B. Plunkett explains gas mask hookup with Thigpen and Pumper Oma Ogle.

VALVES and fittings for new Pan Am plant are checked out by Jess Goodwin, field materials supervisor.

CONTROL panel of the Densitroller. Pointer on the lower scale is set to the desired slurry density. Upper scale shows the air pressure on the pneumatic control system.



BEFORE the Densitroller density of the cement slurry varied as much as a pound per gallon, as this strip chart shows.



SINCE development of the device, Halliburton finds it is able to control density within a tenth of a pound.

New Device Promises Uniform Cement Density

- Halliburton comes up with a push-button controller to keep slurry density at a preselected level. Object: Eliminate weak points in the cement column.

FIELD TESTS have been completed by Halliburton Co. on its new Densitroller, in the latest step in automation of oil - well - cementing operations.

Designed to complement the Densometer that makes a record of slurry density (OGJ, July 7, 1958, p. 70) the new apparatus can be preset for the desired cement weight.

What this means . . . With the new instrument, the cement pumped in a well to set the casing will have more uniform strength throughout the entire length of the cement column. Lack of uniformity can mean weak spots up and down the cement column. Doing away with these weak points helps provide better cement jobs.

Casing is cemented in place for several reasons: To help shut off water, protect the casing from collapse, control production from a pay zone, etc. All of these require that the cement be of uniform composition and strength if the best job is to be done.

How it works . . . Dry cement is picked up at the base of a hopper by a water stream in the usual manner. Downstream from the hopper is a bypass water line with a pneumatically operated valve. A signal from the Densometer to the Densitroller controls the valve.

As the slurry leaves the base of the hopper, it has a higher density than is desired for pumping into the well. The bypass valve adds just the right amount of water to the slurry to bring the density down to the predetermined value, where it remains constant.

Response time of the system is approximately 10 seconds, and densities can be held without trouble to within ±0.1 lb. per gal.

The Densitroller was under development in Halliburton's mechanical research and development department for a period of years before being put in the field. Its progress has been closely followed by another research group—the cement section of Halliburton's laboratories. These chemists have been searching for ideal control methods for the new, complex, multi-additive cementing compositions.

On-the-job tests of the Densitroller have been successful to the point that both engineers and chemists are more than enthusiastic about its performance and the precise control that it can deliver. The instrument has been used on more than 200 successful cementing jobs in the past 6 months.

Most of the field work so far has been on the Louisiana Gulf Coast, with one unit operating in West Texas, concentrated in deep-hole country and areas that present special cementing problems.

BAKER WIRE LINE BRIDGE PLUG, PRODUCT 400-N

RELIABLE BRIDGE PLUG

In average wells or tough ones, its dependability is a matter of record.

Here is a bridge plug that commands a lot of respect. The evidence has been piling up for years that this is probably the most dependable bridge plug available anywhere.

It's got time on its side. Over the years we've refined it into a tool with a tremendous ability to take whatever comes its way downhole.

Whether you measure its life span in hours or in years, a Baker Bridge Plug masters the hydraulic forces in any well—from average wells to the hot, high pressure wells. Reliable is the right word for it.

Leading wire line companies set Baker Wire Line Bridge Plugs accurately and promptly. Other models can be set on tubing or drill pipe. They're made in drillable cast iron for permanent service, and in fast-drilling magnesium for temporary service.

BAKER

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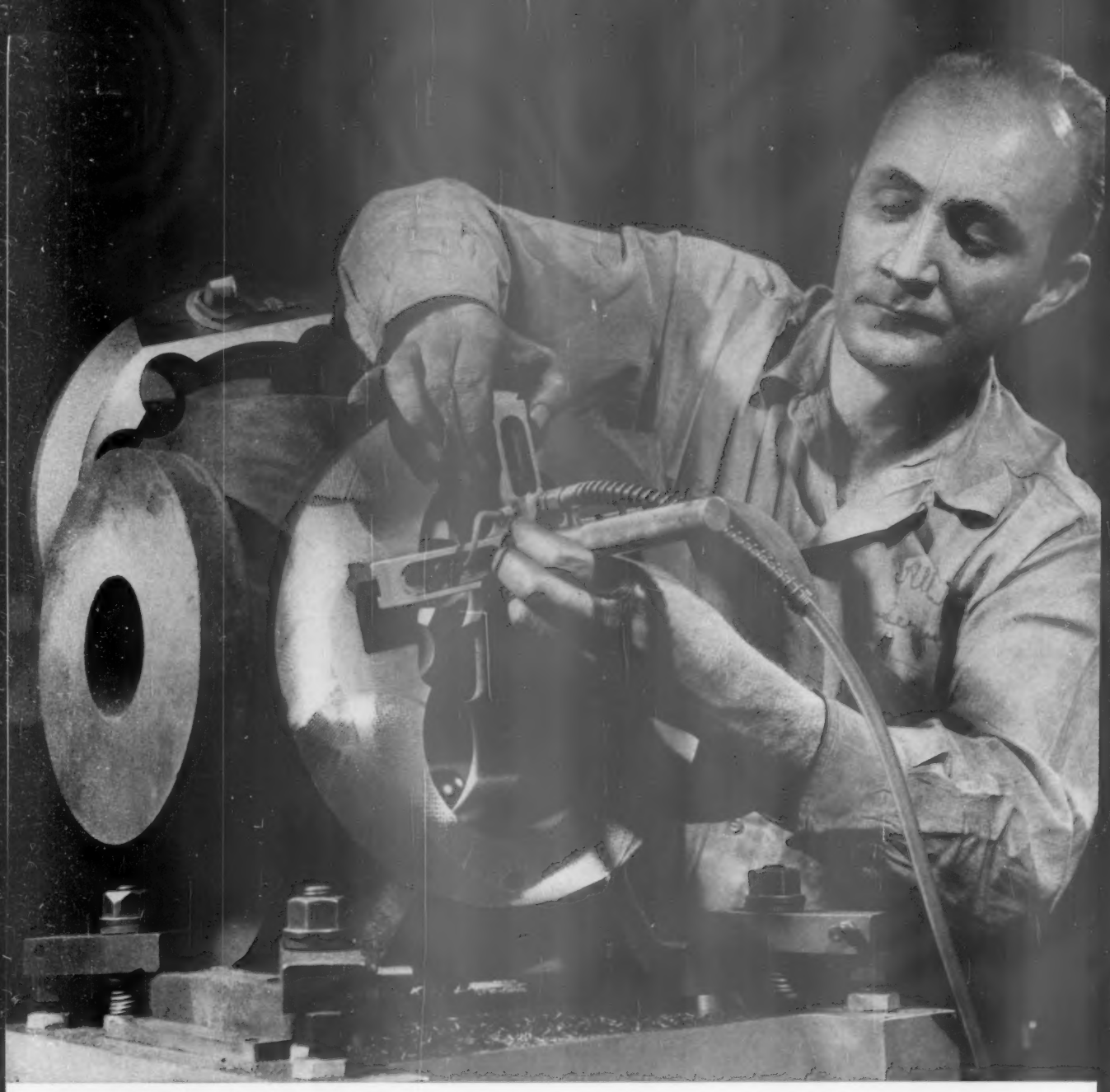


PERFORMANCE STARTS HERE

A 1/1000th inch mistake can reduce a rotary pump's capacity by 10%

Close tolerances are extremely important in a rotary pump. Capacity, efficiency, quietness, and low maintenance depends on the accuracy built into the pump.

That's why Worthington has invested many hundreds of thousands of dollars in precision equipment designed specifically for the manufacture of rotary pumps. The air-gauging machine above, for example, checks the interior dimensions of a rotary to an accuracy of one ten-thousandth of an inch.

Every Worthington rotary is meticulously checked at each stage of construction. When you buy a Worthington pump, rotary or centrifugal, this quality is yours at no extra cost.

For the name of your nearest Worthington pump distributor consult the Yellow Pages. Or write to Worthington Corporation, Section 20-16, Harrison, New Jersey.

WORTHINGTON

Shell Seals off Bottom Water With Plastic

FIRST TEST of a new plastic squeeze technique has been successful in shutting off bottom water in a producing oil well.

The squeeze is an invention of Shell Development Co. and the encouraging initial trial was in a Shell Oil Co. well in East Texas field.

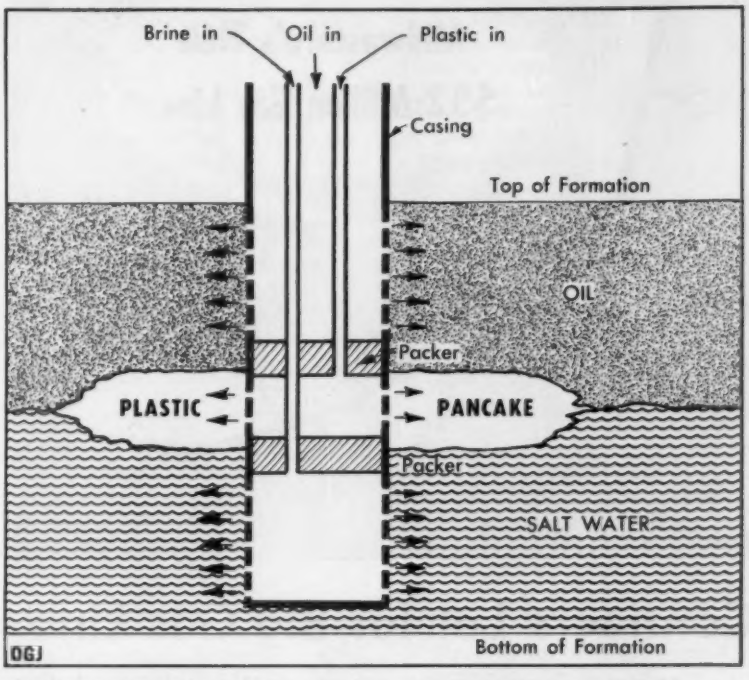
A low-viscosity plastic was squeezed into well perforations at the water-oil contact. Then the well was shut in while the plastic hardened into a solid. When the well was put back on production, the well produced water free. Before, it had an 18% water cut.

Idea behind the Shell method is to form an impermeable "pancake" or cylinder of plastic at the water-oil contact. Such a barrier should reduce the tendency of the bottom water to come up into the well. As a result, the well should produce water-free oil.

Shell's scientists who fathered the squeeze emphasize that it does not fracture the formation. The low-viscosity plastic (no other description has been given) is forced at less-than-fracturing pressure into the pores of the formation. Setting time on the plastic can be regulated so that it does not begin thickening until all is displaced into the oil sand.

Thus, Shell's plastic squeeze is unlike the cement squeeze, which depends on breaking down the formation.

The company already has plans to treat other wells with a bottom-water problem. In addition, Shell men see possibilities for the method in such applications as shutting off their zones in water-injection wells and sealing entire water-bearing formations where they impede drilling or production.



HOW IT'S DONE is shown here. Plastic is squeezed between brine and oil and forced into the pores of the producing formation.

Placing the plastic . . . For the trial run, Shell used the work-a-day squeeze rig-up common for cementing, fracturing or acidizing:

A squeeze packer was run on tubing and the treating fluid was pumped down the tubing. In this case, the packer was set 5 ft. above the oil-water contact in the well's producing interval. Then squeeze pumps at the surface displaced the plastic down the tubing, out into the well bore below the packer, and into the formation pores.

There was one important difference between this treatment and other more-conventional jobs: Lease crude was pumped down the tubing-casing annulus simultaneously with the plastic down the tubing. Pressure of this oil kept the plastic below the packer from forcing its way up into the oil zone.

With this arrangement, Shell figures the hardened plastic is roughly cylindrical in shape. Such a cylinder, while effective, is probably a waste of plastic, Shell men think. What they'd really like is a "pancake" spread out flat, thin, and to greater diameter. And they think they can place such a pancake.

Here is how they propose to turn the trick on some future job: Run two packers and two parallel tubing strings. The two packers would straddle the oil-water contact, one above and one below.

The plastic would be squeezed down one tubing string and up between the packers; the oil would be pumped down the tubing-casing annulus just as in the first job. Down the second tubing string would go salt water; it would be pumped out below the bottom packer into the water portion of the producing zone.

With oil pressing from above and water from below, the plastic would have only one direction to go—out. If it should go out uniformly, Shell would have the pancake it wants. Such a barrier, the company believes, will be an effective lid to keep bottom water in the formation as oil is produced from above.

Many formations . . . Shell's trial well produces from 50 ft. of Woodbine sand. Thus, it was a good choice in two ways for this experiment.

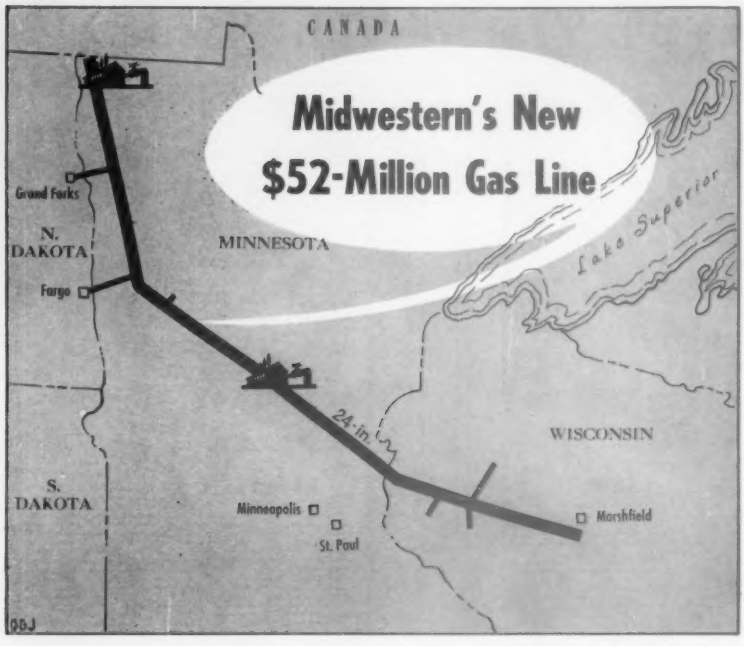
The sand is thick enough that not all production would be cut off if there were some miscalculation. And, second, the Woodbine is quite permeable so that displacing the plastic was easy.

Shell doesn't think that its water shutoff is by any means limited to such ideal conditions. Low viscosity of the plastic should make it usable in much tighter formations. And, the company expects that with more experience it can successfully treat much thinner sections.

The plastic used on the East Texas wells won't work in limestone reservoirs, Shell says. In fact, the trial run was made only after the section to be treated had been washed with acid to remove any carbonates.

However, Shell men see no reason why a plastic cannot be formulated to work in limestone and other carbonate zones.

Liquid plastic as a solution to production problems is being used by others. Sinclair Research Laboratories, for example, has developed and is using in the field a liquid plastic which it pumps into formation fractures to halt channeling of injection water in a flooding project (OGJ, Feb. 8, p. 60).



Contracts Let for Big Gas Line

. . . to move Canadian gas into upper Middle West. Action winds up 5 years of preliminaries to actual construction.

ELEVEN CONTRACTS have been awarded by Midwestern Gas Transmission Co. to build its $52-million line that will move western Canada gas into the upper Middle West by November.

Midwestern, a subsidiary of Tennessee Gas Transmission Co., announced the following contracts on the 504-mile 24-in. main line:

Bechtel Corp., 155 miles from Canadian border to Becker-Clay county line in Minnesota; Grayco Constructors, Inc., 54 miles from Becker-Clay county line to near New York Mills, Minn.; H. G. Price Co., 56 miles from New York Mills to Mississippi River; Houston Contracting Co., 109 miles from Mississippi River to Wanderoos, Wis.; Contracting & Material Co., 54 miles from Wanderoos to Chippewa River; and Panama, Inc., 66 miles from Chippewa River to Marshfield, Wis.

Other contracts for the system are: Popich-Marine Construction Co., Mississippi River crossing; Pentzien, Inc., St. Croix River crossing; Missouri Valley Dredging Co., Chippewa River crossing; Texas Pipeline Construction, Inc., 16 miles of laterals; Bristow-Hyde Engineering Corp., 39 miles of laterals; and Houston Contracting Co., gas-compressor stations at Hallock and Staples, Minn.

Approximately 200 million cubic feet of Alberta gas daily will move into Midwestern's line from the lines of Trans-Canada Pipe Lines, Ltd., at a point on the international border south of Winnipeg.

Of this amount, 158 million will be delivered at the Marshfield end to the lines of the Michigan Wisconsin Pipe Line Co. The remainder goes to other utilities except for a small amount going directly to eight communities.

Construction will start this week, and the entire project will be completed by November 1.

Long battle ends . . . The recent approval by the Federal Power Commission and Canadian authorities climaxed a long struggle by Midwestern to import the first Canadian gas into the Midwest.

Midwestern filed its first application almost 5 years ago (OGJ, Oct. 17, 1955, p. 88). In its original form the project called for a 1,112-mile 24-in., 12-in., and 16-in. line from Emerson, Man., to near Nashville, Tenn.

Gas was to be pumped from both ends toward Chicago. When the Canadian supply hit a snag, the southern section was offered separately as a 350-mile 30-in. line, which was put into operation last October from Portland, Tenn., to Joliet, Ill.

Success of the northern section will give the parent company, Tennessee Gas, a firmer beachhead in the Midwest market. And it will greatly speed the payoff for Trans-Canada, which has in Midwestern its biggest single customer. Trans-Canada is spending $32 million this summer to expand its system to deliver gas to Midwestern.

Refinery in Florida

. . . firmed up with crude supply, building date.

CONSTRUCTION of a Florida refinery, first proposed more than 8 years ago, is now scheduled to start in November.

The plant is to be built by Florida Oil & Refining Co. at a deep-water site on the St. Johns River at Jacksonville. It will have an initial design capacity of 15,000 bbl. daily.

M. H. Robineau, president of the company, says important units of the plant will be over-sized so that during the construction period the plant capacity could be enlarged to 25,000 bbl. per day.

The company has signed a long-term contract for 10,000 bbl. of crude daily with U. S. Oil of Louisiana, Inc.

Carl M. Loeb, Rhoades & Co. of New York, Frontier Refining Co. of Denver, and John Mecom of Houston are the joint owners of the common stock of Florida Oil & Refining. Mecom also owns U. S. Oil of Louisiana.

The refinery will include a crude unit, splitter and straight-run stabilizer, delayed coker, fluid catalytic cracker, Merox unit, and a Platformer-Unifiner.

PROCESSING

A 12,000-bbl. alkylation plant is under construction at the Whiting refinery of Standard Oil Co. (Ind.). The unit will have three 120-ft. reactors and a 150-ft. fractionating tower. The plant is scheduled for completion early in 1961. Bechtel Corp. has the construction contract.

A 50% increase in oxo-alcohol capacity has been made at the Baton Rouge refinery of Esso Standard Division, Humble Oil & Refining Co. The annual capacity at the refinery is now 90 million lb. Enjay Chemical Co., the Humble division which markets the output, says the expansion enables the marketing of hexyl alcohol and semicommercial amounts of hexadecyl alcohol.

Stanotex Puts PDQ In Competition With Independent Stations

STANDARD Oil Co. of Texas is making use of its products line between El Paso and Albuquerque to compete with independent or unbranded marketers.

Stanotex has leased 29 stations, most of them in the Albuquerque area, from Hedges Oil Co. and will market a new gasoline to be known as "P.D.Q." rather than its usual "Chevron" brand name.

The new brand will retail at 2 to 2½ cents per gallon less than Chevron.

The Hedges stations formerly were supplied by El Paso Natural Gas Co. They will now take gasoline from Stanotex's El Paso refinery, connected by the products line with Albuquerque.

Stanotex now has 789 outlets in Texas and New Mexico. The company is a subsidiary of Standard Oil Co. of California.

Deep Alabama Test Planned

ALABAMA'S Citronelle field may get a 20,000-ft. test. G. H. Jett of Jett Drilling Co., Shreveport, said last week he is considering the deep test and has applied for a drilling permit.

Citronelle field, source of the bulk of Alabama's crude, produces from 11,000 to 11,500 ft. The proposed test would be Alabama's deepest hole and would be searching primarily for gas.

Dixie, Gulf drill at a mile-a-day rate

GULF Oil Corp. and Dixie Drilling Co. have drilled better than a mile a day.

Gulf reported last week that a well in Louisiana's Timbalier Bay went from 2,043 ft. to 7,455 ft., a distance of 5,412 ft., in a 24-hour period. The record beat another set by Dixie's rig No. 3 crews of the week before, when they made 5,140 ft. a day.

Gulf has been pioneering new drilling techniques in Timbalier Bay by using heavy bit weights, high rotary speeds, and high pump pressure.

Westcoast Plans to Loop Line

. . . from Canada to bring capacity to more than a billion cubic feet. No timetable set for the 688-mile project.

A SECOND 30-in. line is planned by Westcoast Transmission Co., Ltd., increasing ultimate capacity of the 688-mile British Columbia Washington line to over a billion cubic feet daily.

No construction date has been given for the loop, but the project to provide the major supply is scheduled for completion in the fall of 1961. This is a 250-mile 30-in. line from the Fort Nelson, B. C., district, scene of major recent discoveries, to Peace River (OGJ, May 30, p. 65).

Present capacity of Westcoast is 450 million cubic feet daily. With added horsepower, it could be increased to 650 million. Ultimate capacity would be doubled with construction of a new 30-in. line.

The ambitious expansion plans were announced in the company's annual report, which shows a loss of $915,794 on operations the past fiscal year. This is a reduction of $362,840 from the 1958-59 loss. Westcoast started operating in the fall of 1957 and is steadily building its gas load.

Sales averaged 244 million cubic feet daily last year and are forecast for more than 300 million cubic feet this year. This volume of business is expected to turn the company's first operating profit.

Westcoast reports rapidly increasing demand in British Columbia and in western United States, served in part by Westcoast through El Paso Natural Gas Co.

The company forecasts an increase in demand in western U. S. of a billion cubic feet daily within 5 years, and adds:

"El Paso will and must look for an increasing proportion of its total gas requirements to be supplied from the gas resources available through the Westcoast system."

BRIEFS . . .

Capacity of Montecatini's Neal, W. Va., polypropylene plant has been expanded from 10 million lb. to 25 million lb. annually since the plant was first announced. It is being constructed by Novamont Corp., wholly-owned American subsidiary of Montecatini. The propylene stream for the plant will come from the Catlettsburg, Ky., refinery of Ashland Oil & Refining.

United Carbon Co. will spend $1 million to expand its Baytown, Tex., plant to an annual capacity of 200 million pounds of carbon-black synthetic-rubber masterbatch. Present capacity is 145 million. New equipment will be highly automated.

A temporary shortage of Saskatchewan asphalt-type crude, during the peak Canadian road-building season, has made it necessary for British American Oil to purchase 15,000 bbl. of 10°-gravity crude from Venezuela. The crude will be used to manufacture asphalt.

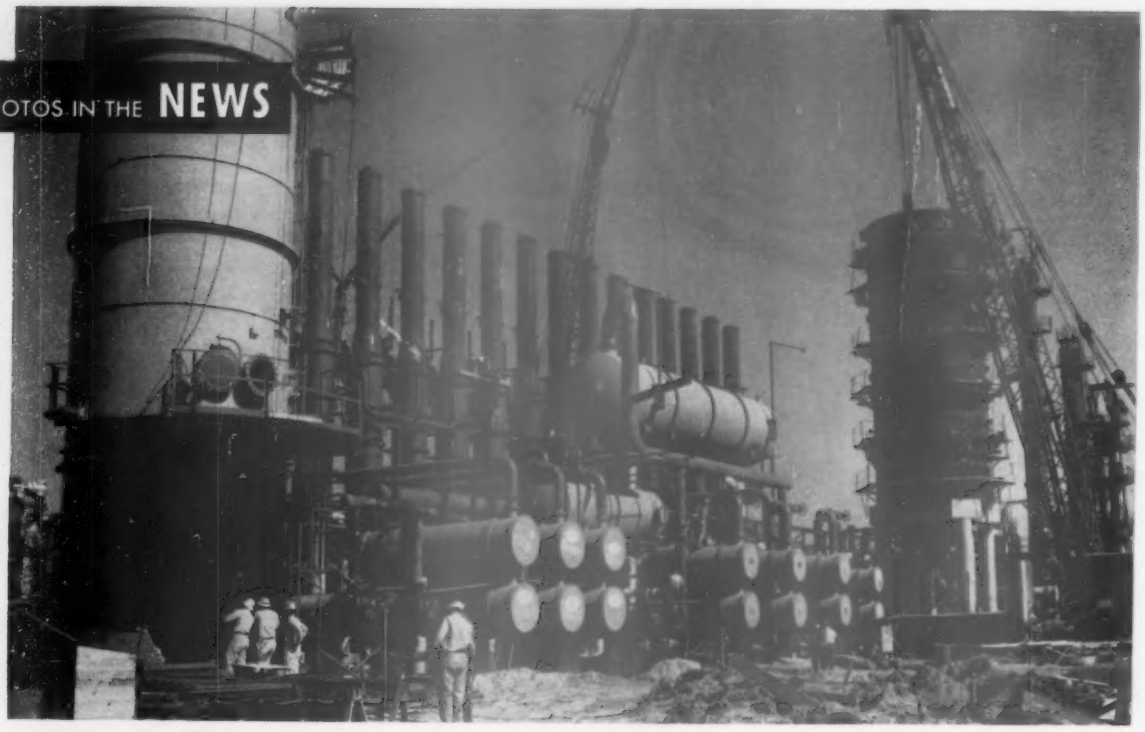
India's first synthetic rubber plant has been contracted to The Lummus Co. It will turn out an initial 20,000 tons per year for Synthetics and Chemicals Ltd., a new company formed by Firestone Tire & Rubber Co. and Kilechand Devchand and Company Private Ltd., a Bombay firm. The $30 million project can be expanded to 30,000 tons.

Also for Refiners . . .

IN THE NEWS: Few problems seen for Cuba in operation of seized refineries (p. 57) . . . Esso warns of a coming shortage of residual fuel on the East Coast (p. 60) . . . Texaco strike threat ends as Port Arthur contract is signed (p. 63) . . . Florida refinery firmed up as a crude supply is contracted and November construction date is set (p. 72) . . . Ohio Oil announces it will build a refinery in Spain to process its Libyan production (p. 76).

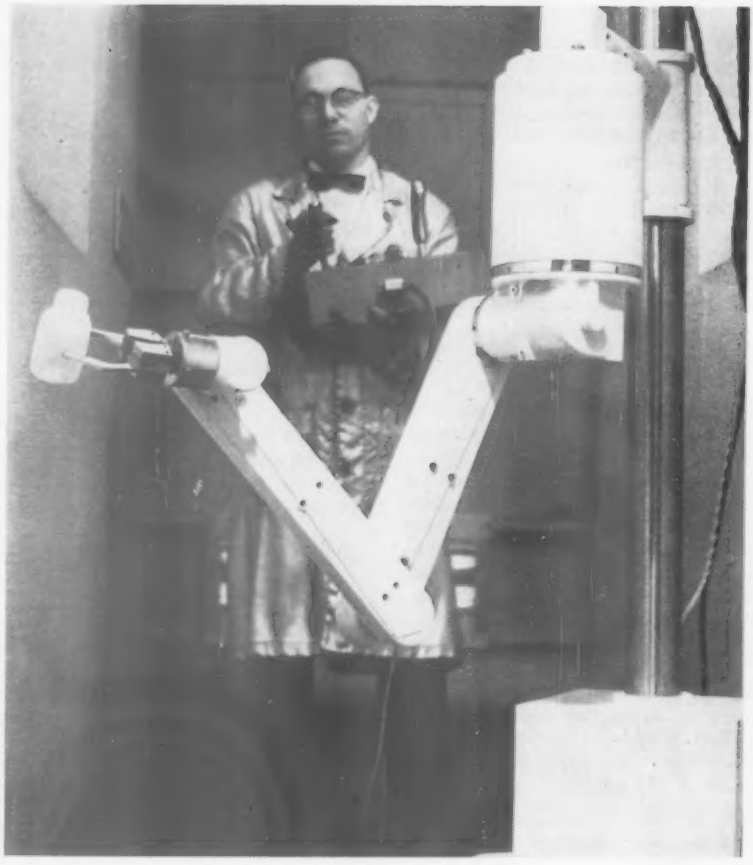
PLUS THESE TECHNICAL REPORTS: Sweetening natural gas by selective adsorption (p. 86) . . . A look 3 years later at Tidewater's Delaware City plant instrumentation (p. 110).

PHOTOS IN THE **NEWS**



Superlative Unit

THE WORLD'S LARGEST ethylene unit is being built at Beaumont, Tex., by Mobil Chemical Co., newest operating division of Socony Mobil. The plant, scheduled for completion early in 1961, will have the capacity to produce 380 million pounds of ethylene per year. It is Socony Mobil's first major U. S. venture into petrochemicals.

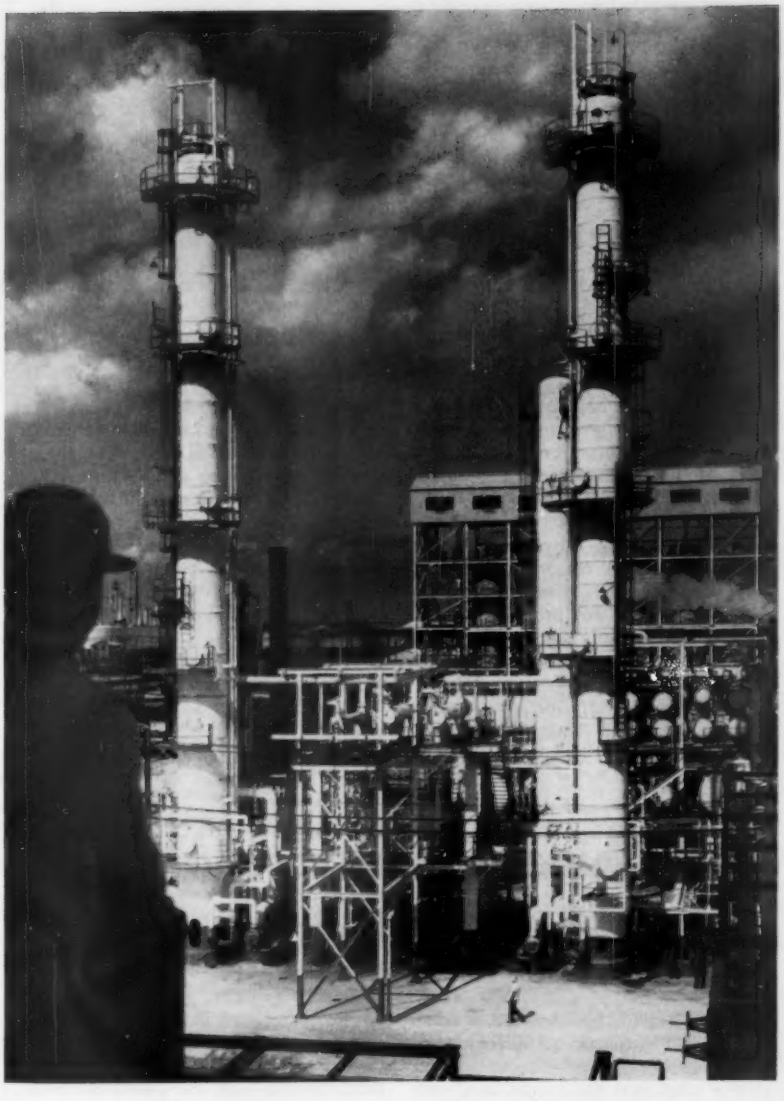


Rocket Researcher

ONE-ARMED but agile is this Esso Research & Engineering robot, the first of its type. Its touch is delicate enough to operate a slide rule but, if necessary, its muscles can lift a 45-lb. load. Esso developed the lab assistant to handle materials used in sensitive chemical operations in the company's research into experimental rocket fuels. The robot, itself, is electrically powered, but its hand works hydraulically.

Gulf's New Towers

TWO PROPYLENE polymer fractionation columns have been placed in operation at Gulf Oil Co.'s 6,000 bbl. per day catalytic polymerization unit at Port Arthur, Tex. One of the products will be a feed stream at Gulf's new oxo alcohol plant being constructed in Philadelphia.



Teachers' Oil School

TEXAS SCHOOLTEACHERS are briefed on the workings of the oil industry at the University of Houston. Fifty-one teachers attended the 3-week sessions. The project is sponsored by the university, Texas Mid-Continent Oil & Gas Assn., and 50 oil companies.

Processing of Libyan Oil in Spain Is Planned

• Ohio Oil Co. proposes the construction of a 25,000-bbl. refinery on the northern coast of Spain to process a portion of the crude found by Oasis.

THE REFINING and marketing of Libyan oil in Spain is planned by Ohio Oil Co.

The company has filed a proposal with the Spanish government to build a 25,000-bbl. refinery on the northern coast of the country.

Ohio's subsidiary, Ohio Oil International of Libya, Inc., is a partner in Oasis Oil Co. of Libya, Inc., which has completed 11 oil or gas wells in Dahra field. The latest completion (OGJ, July 4, p. 76) produced at the rate of 11,500 bbl. daily. The company also has hopes for another major field in Block 59.

The other partners in Oasis, Continental Oil Co. and Amerada, have not announced marketing plans. Neither has any connection with the Spanish venture planned by Ohio.

Refining plans . . . J. C. Donnell II, president of Ohio, says his company would be associated with Companie Iberica de Petroleos and some leading Spanish banking interests in the refining project.

Iberica de Petroleos is a holding company which is partly owned and managed by the Fierro family, an influential Spanish banking and industrial group.

The refinery, which is expected to cost $18 million, will be scheduled for completion within 2 years after government approval is obtained.

The Spanish government would hold 52% ownership in the refinery and the balance would be divided between Ohio Oil and its Spanish associates.

The country now has one government-controlled and operated refinery, an 80,000-bbl. plant near Cartegena.

Plans for moving the Libyan oil to the Mediterranean Coast have already been made by Oasis. It has invited contractors to submit bids on a big-inch line running north from Dahra field. The line will be at least 30 in., with some sections possibly as large as 42 in.

The terminal site, from which Ohio would probably ship its crude to Spain, has not been selected. Work on the crude line is expected to begin within the next few months.

Red China Pushes Shale Oil

. . . with plans to boost production by placing thousands of small "home brew" plants in comrades' backyards.

RED CHINA has decreed a crash program of synthetic oil development to supplement its crude production.

The plan calls for a combined output of 30-million tons a year, or 600,000 bbl. daily, of shale, coal, and crude oil in 1962. This is at least five times the original production target.

There will be no let up in the drive to increase crude production. But the added, all-out emphasis on shale and coal oil indicates the Chinese realize domestic crude output cannot grow anywhere near as fast as skyrocketing internal demand.

Chinese officials say the backbone of the program will be small and medium-sized plants which will produce oil from shale and coal deposits scattered throughout the country.

The Communists claim thousands of these back-yard plants already have been built. Now, improved prototype shale-oil plants with a capacity of only 300 tons, or 2,100 bbl., of oil per year have been developed. These small units reportedly can be built in a month by local labor at minimum cost.

Crude plans . . . The Chinese do not specify the relative roles of petroleum and other oil in the new program. But crude in the last few years has been responsible for most of the country's gains.

Petroleum accounted for 65% of the 45,000 bbl. daily produced in 1958. Crude also comprised the lion's share of the 74,000 bbl. daily of oil produced last year, and will be in back of a gain to 104,000 bbl. daily this year.

China says that it had 32 commercial oil fields and 18 gas fields by the beginning of 1960. This compares with four oil and two gas fields in the pre-revolutionary period, before 1949.

Four fields yield most of today's production. These are Yumen field, in the Chiuchuan basin of Kansu Province, Karamai field in the Dzungarian basin of the Sinkiang Uighur Autonomous Region, and from pools in the Tsaidam and Szechuan basins.

The Chinese say they have 916 exploration parties working in 34 different areas. Ninety-four of these are geophysical crews. They also claim to have about 480 modern drilling rigs.

The Communists have taken the lid off drilling data for their first decade in power. They report 2,964 wildcat and 1,871 development wells in the 10-year period ending in 1958, in which year they drilled almost 5.7 million ft. of hole. By 1958 they also were taking wells as deep as 11,480 ft., and averaging 2,208 ft. of hole per month with heavy and medium rigs.

U. K. Firms May Merge

ONE BRITISH independent will absorb another if stockholders of Manchester Oil Refinery (Holdings) approve a formal purchase offer from Lobitos Oilfields.

Manchester Oil's assets include a 3,500-bbl. refinery at Manchester which produces lubricating oil and specialty products. It also has its own marketing organization, and interests in local chemical and equipment companies and Albatros refinery at Antwerp.

Lobitos carries on a small-scale integrated operation with crude production in Peru, a 4,200 bbl. refinery at Ellesmere Port and several marketing companies in U. K. and Ireland.

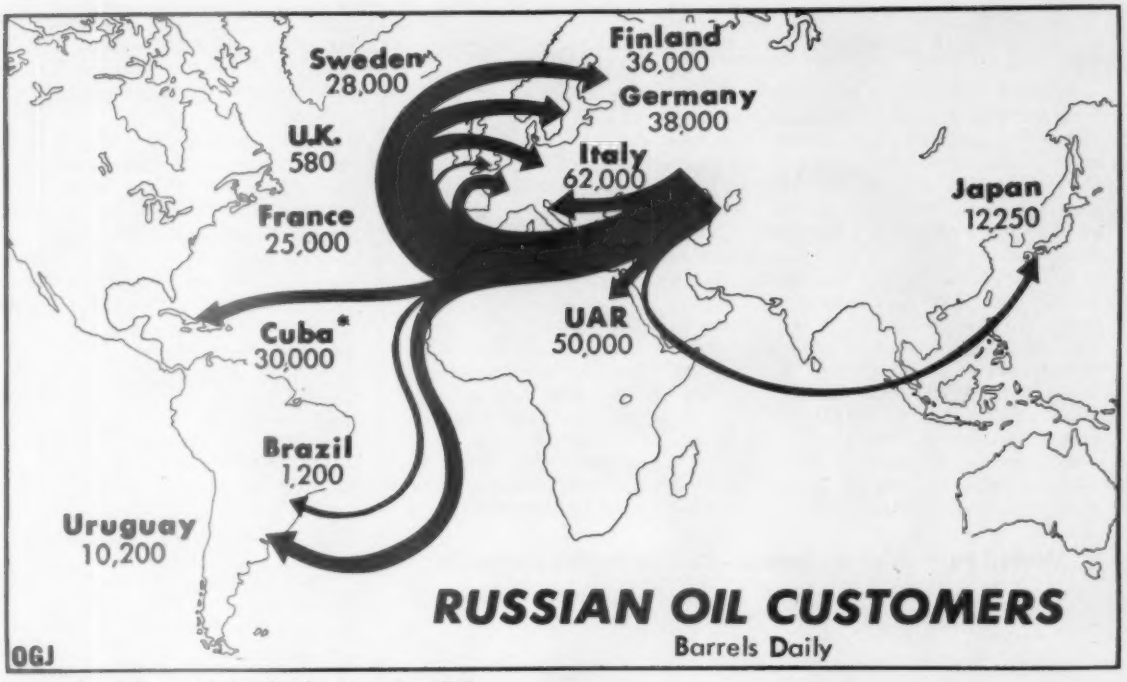


*Figure for Cuba is 1960; all others are for 1959.

Soviet Oil Exports Could Get Rough

▶ Russians deny they're trying to break world oil-price structure, but they are making some barter deals at sharp discounts where politically expedient.

Paul Swain
International Editor

THE BIG QUESTION to crude peddlers today is not "how much" when they think of Russian oil exports, but "how much more?"

There's no longer any question that the Russians are making themselves felt in world oil markets. Soviet oil shipments to areas that once were assured free world oil markets are rising pretty sharply. They are still more annoying than a real threat, but if they continue to increase it could be a different story.

With one eye on soaring Russian oil output and the other on already flooded world markets, marketers are beginning to feel a little like the man with both feet caught in a bog when the first of a swarm of mosquitoes locates him and then buzzes off to find his buddies. This could get rough.

There is no yardstick for Russian behavior in the oil marketplace. Publicly they insist they have no intention of trying to break the world oil price structure. Then, they offer their oil in barter deals and at sharp discounts in areas where they feel it politically expedient.

Changing pattern . . . Historically, Russian oil exports to the free world averaged a pretty steady 3% of her oil production. At the same time, total exports to both free world and satellite nations had an almost predictable relationship to Soviet oil production at home. Then in the 1957-58 period, the Russians began to hit their stride in oil production and faltered a bit in new refining capacity and oil transportation. Exports began to rise—faster to the outside world than to the rest of the Iron Curtain sector. (OGJ, Oct. 19, 1959, page 100).

Firm figures on the current situation are hard to nail down, but it is apparent that the Russians last year boosted exports to the free world much higher than the 200,000 bbl. daily average of 1958. Exports to major customers alone topped 275,000 bbl. daily in 1959. It is just as apparent they are making every effort to show more of a gain in 1960.

Ironically, the world-wide glut of crude oil has created the very means for Russia to do this. It has made the tankers, which the Soviets do not have, readily available on the charter market at very cheap prices. Few oil companies can stay in business bartering crude for the agricultural output of underdeveloped nations. But, the Russians can and are doing it on favorable terms to currency-short nations.

In more developed regions such as Western Europe, the Russians bargain just about as hard for foreign exchange as any negotiator. But, they are making better deals than capitalistic concerns here, too. They are increasing their piece of the European market.

Growing markets . . . Italy, with very little oil of its own, is a classic example. Some industry sources with a sizable stake in the Italian market fear that half the country's oil consumption may be furnished by the Russians in the not-too distant future. Here's why:

In 1956, when Italy imported just under 198,000 tons of Russian oil (about 3,800 bbl. daily) the Soviet shipments represented only 1.1% of Italian needs. In 1957, Red oil shipments jumped to almost 760,000 tons (about 15,200 bbl. daily) and accounted for almost 4% of Italy's domestic demand.

Last year, this Russian oil to Italy reached 3,100,000 tons (about 62,000 bbl. daily) and represented 12.2% of

Soviet tanker fleet is small potatoes

RUSSIA is making every effort to break into the international oil picture but one thing is sure—not much Soviet oil will move in Iron Curtain tankers. Russia and her satellites have only 140 tankers adding up to a mere 1,224,000 d.w. tons.

All the Iron Curtain countries put together have only a third as many tankers as the U. S. and their combined deadweight tonnage is only one sixth of that of the U. S. fleet. Russia itself has 123 tankers totaling 1,040,000 d.w. tons, an average of 8,500 tons.

In contrast to Russia's small-capacity ships are the behemoths flying the Liberian flag. Liberia is now the first nation of the world in tanker tonnage . . . its 420 vessels averaging 28,000 tons. A large portion of these is U. S.-owned and is available to this country in the event of an emergency.

Despite the glut of tankships that has existed since the Suez crisis settled down, additions to the free world fleet were greater than ever in 1959. Last year 244 new tankers were delivered. They totaled 7,286,000 tons, an average of just under 30,000 tons per ship. The best previous year from the standpoint of numbers was 1954 when 243 tankers were delivered. They totaled 4,612,000 d.w. tons, an average of 190,000 tons.

World tanker scoreboard—Russia ranks eleventh

Nation	Number	Deadweight Tonnage	Average Size*
1. Liberia	420	11,767,000	28,017
2. United Kingdom	593	9,626,000	16,233
3. Norway	505	9,269,000	18,354
4. United States	421	7,637,000	18,140
5. Panama	191	3,870,000	20,262
6. France	141	2,743,000	19,312
7. Italy	149	2,377,000	15,953
8. Japan	120	2,133,000	17,775
9. Sweden	102	1,923,000	16,892
10. Holland	110	1,798,000	16,345
World totals	3,367	60,640,000	18,010

*Deadweight tons.
Source: Maritime Administration, U. S. Department of Commerce.

Italian demand. It is expected to be even greater this year.

This same pattern has an almost tedious repetition in other markets where the Russian bear has a toe in the door.

In Uruguay last year's average of 10,200 bbl. daily in Russian imports was about 6,000 bbl. daily more than the previous year. Brazil bought an average of 1,200 bbl. daily from Russia in 1959, but recently signed a new 3-year trade pact that calls for an average of about 3,650 bbl. daily over the period.

Fast-expanding Japan, after several years of buying small amounts of Russian crude, last year began buying an average of 12,250 bbl. daily under a long-term contract with freight rates ruinous to anyone but the Russians.

Less than 60 days ago, Idemitsu Kosan, Japan's largest independent refiner, signed a new 6-year contract with the Russians which provides for the sale of from 20,000 to 30,000 bbl. daily. The Soviet crude is going for a delivered price of 22 cents per barrel below the average paid by the Japanese refining industry for Middle East oil.

In addition the cheap Russian oil will allow Idemitsu to buy even more in the future under the complicated foreign-exchange formula set up by the Japanese Government. The less a Japanese company pays per barrel, the larger the currency allocation when another money quota for imports is granted by the government.

U. K. is different . . . Great Britain so far is about the only Western European country holding the line against Russian oil and this may not last. In 1959, the U. K. imported only about 580 bbl. daily of Russian oil. Most of it was lubes. This was a drop of almost 200 bbl. daily from imports in 1958.

This month, however, a Soviet delegation arrived in London for new trade talks making no secret of the fact they are aiming at a piece of the British oil market. With substantial Middle East oil sources of her own, Britain is not likely to look with too much favor on Russion oil offers on an official level.

A large English garage operator said last week that the Russians had offered him gasoline at a price of about 7.5 cents a gallon before customs duties, taxes, and distribution costs. This is about 30% below average prices for British-refined gasoline.

Growth elsewhere . . . Other Russian oil customers in Western Europe follow the pattern already well established in Italy, but not to the same degree. Germany last year bought an average of 38,000 bbl. daily of Russian crude, an increase of more than 20,000 bbl. over 1958. Finland, with its 36,000-bbl. daily average of Soviet oil shipments, was up 22,000 bbl. over the previous year. Sweden increased its Russian oil purchases last year by 12,000 bbl. daily to reach more than 28,000 bbl. per day. Even France, which has rapidly expanded its own oil supplies, bought almost 25,000 bbl. daily of Russian oil last year, about 10,000 bbl. daily more than the year before.

The United Arab Republic, primarily Egypt, last year boosted its Soviet oil purchases to more than 50,000 bbl. daily in spite of the fact it is pushing hard to develop its own oil production. Egypt traded cotton and other locally produced goods for the oil, a deal she would have a hard time selling her oil-producing Arab neighbors.

The Russian move into the Caribbean has already been more than well publicized. A barter deal with Cuba for sugar provides Cuba with 30,000 bbl. daily of Russian crude.

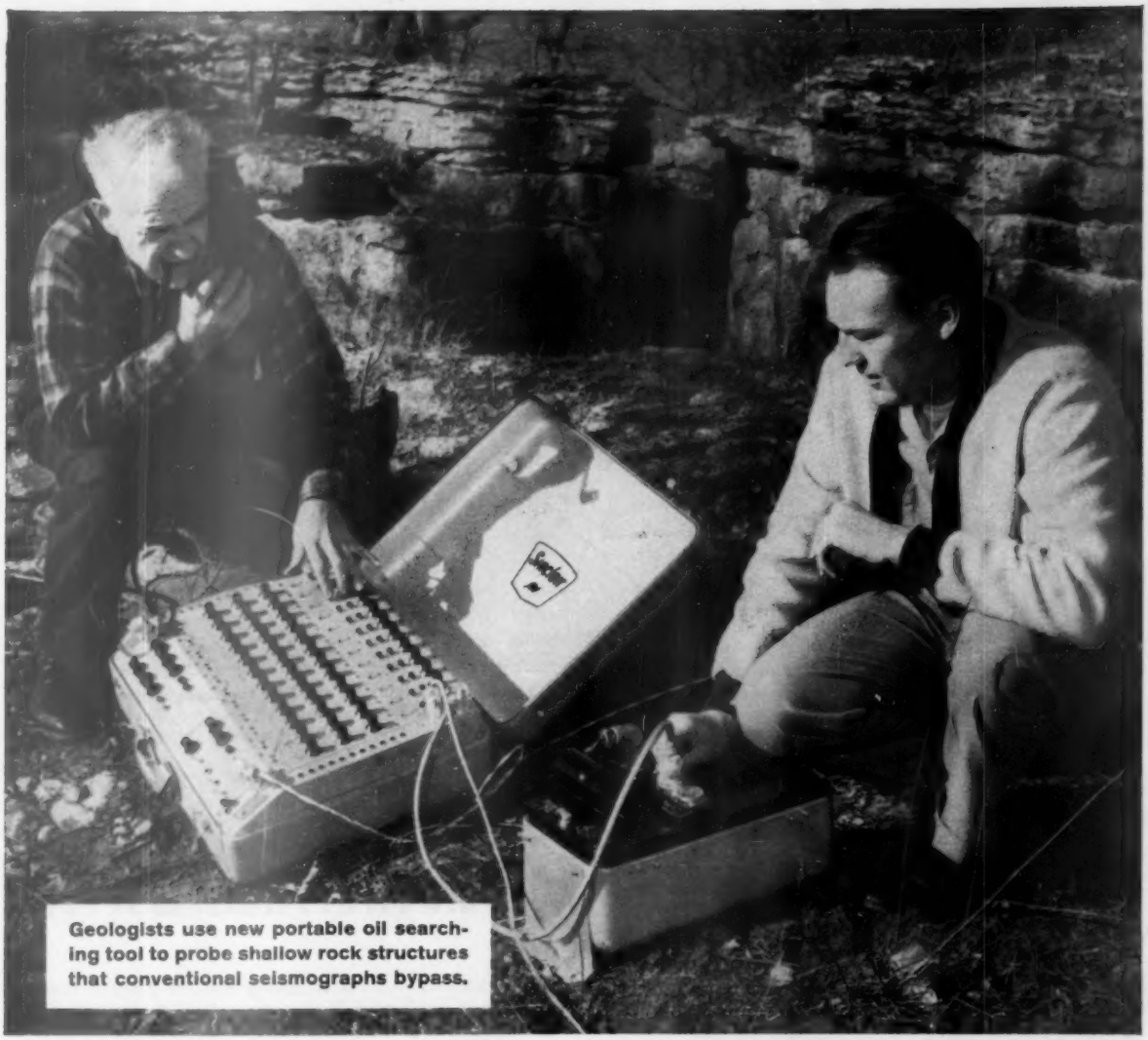
Three major refining companies, Esso, Texaco, and Royal-Dutch Shell, had been importing 70,000 bbl. daily of Venezuelan crude. Their refineries were seized by the Cuban revolutionary government after the companies refused to process the Russian crude.

Crude shipments from Venezuela have ceased and Cuba may turn to the Russians for more crude and products. Soviet gasoline shipped to Cuba since the government-refiner dispute started is on sale throughout Oriente.

A few months ago, the head of Sojuzneftexport, the Russian oil exporting agency, scoffed at suggestions that the Russians were waging an economic war with the West by trying to cut the bottom out of established oil prices.

He said prices asked by the Russians are normally pegged to a U. S. oil-pricing-service reports, but he obviously was referring to the customers with currency and a desire to bargain.

This same agency last week offered the little Far Eastern country of Ceylon a deal by which the Russians would supply all the Ceylonese demand for oil products at 10% to 20% below world prices—and take payment in rubber and tea.



Geologists use new portable oil searching tool to probe shallow rock structures that conventional seismographs bypass.

Meeting the Future Need for Oil

The biggest job America's oilmen face is finding economically all the petroleum energy this country will need in the "soaring sixties." Most economists expect *petroleum demand to rise 50 per cent by 1970.*

Sinclair is tackling the heart of the problem by expanding its research into more efficient means of finding and recovering oil and gas. It is seeking scientific break-throughs that will mean more barrels of oil found and recovered per dollar spent.

One experiment being tested is the unique, portable seismograph above. Developed by Sinclair Research Laboratories, Inc., this device quickly probes subsurface areas bypassed by conventional instruments.

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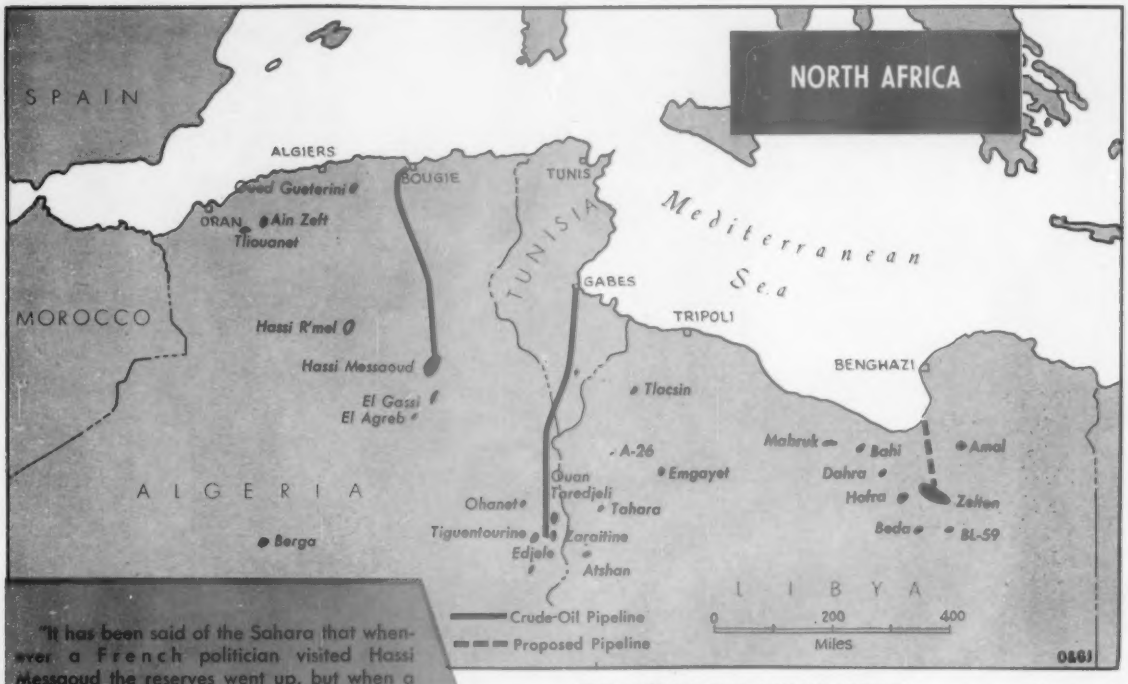


THE SAHARA AND LIBYAN DESERTS are comparable in size with those of Saudi Arabia and Iran . . . but the concession terms are very different. Fig. 1.

"It has been said of the Sahara that whenever a French politician visited Hassi Messaoud the reserves went up, but when a technician went they came down. Certainly one does not hear now in Algeria the previous estimates of 1 billion tons of reserves, and so far, there is even less basis for such a figure for Libya. . .

"Taking the recently published figures of world oil reserves in The Oil and Gas Journal, it is clear that with the Sahara at 5 billion barrels and 1½ billion for Libya, there is no comparison with the Middle East's 180 billion or even Iraq's 25 billion, let alone Kuwait's 60 billion barrels. . .

"It is the purpose of this article to attempt a fundamental technical and geological comparison of the respective oil provinces, based on a 30-year connection with the Middle East, but only a recent brief visit to the Sahara and Libya."

—*The author*

Which holds the

SIXTEEN YEARS AGO, Dr. E. DeGolyer caused a sensation with this report to the U. S. Government:

". . . the center of gravity of world oil production is shifting from the Gulf-Caribbean area to the Middle East and is likely to continue to shift until it is firmly established in that area."

He was referring to an increase in Middle East proved reserves in the 5 years immediately before the last war of some 22 billion barrels, which equaled total world oil reserves at the beginning of that period. Middle East reserves have since increased nearly sevenfold, thus fulfilling the second part of his prophecy.

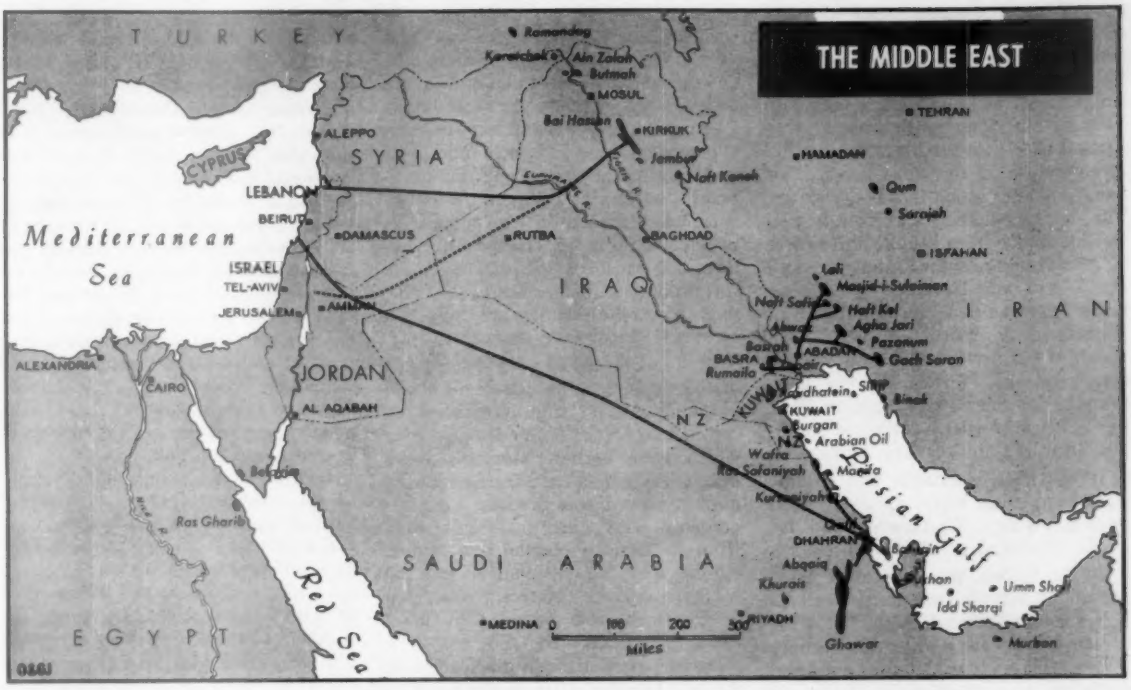
Now, from the volume and tenor of press comment since the big discovery well at Hassi Messaoud in the French Sahara in July 1956, and the still bigger one at Zelten in Libya 3 years later, one gets the impression that the center of production is moving back to North Africa.

Compared with DeGolyer's famous statement, the recent spate of articles in English and French-language newspapers, magazines, and trade papers is no doubt partly inspired and somewhat speculative. They have already drawn a response from an expected—and interested—quarter, Saudi Arabia's Abdulla al Tariki, that all the oil reserves discovered to date in North Africa amount to less than half those of a single field there, viz. Abqaiq.

The geographical advantages of oil fields in the Sahara and Libya in respect to European markets are obvious from a map. Hassi Messaoud is about 400 miles from its Mediterranean terminal at Bougie, compared with Kirkuk's 550 miles and Abqaiq's 1,000 miles. Bougie is only 400 miles from Marseilles as against 1,600 miles from the Levant terminals and 4,800 miles from those at the head of the Persian (Arabian) Gulf. The Skirra terminal will be about the same distance, 450 miles, from its Edjele oil fields and 750 miles from Marseilles. Zelten is 100 miles from Mersa Brega on the Gulf of Sirte, which lies 600 miles east of Skirra, and is about 1,000 miles from Marseilles.

The French are claiming a crude-transportation advantage of about 50 cents per barrel, and the Libyans even more. To set against this, the exploration charges in the Sahara are 15 cents per barrel more than the average for the Middle East fields, and exploration is also very expensive in Libya.

The author was formerly chief geologist and general manager of production for Iraq Petroleum Co., Ltd., and associated companies; their geological adviser since retirement in 1959.



WHERE ELSE but the Middle East could a 10-billion-barrel reserve be estimated with only nine wells, as on Burgan in 1940? Where else are "stepouts" 10 miles away? Fig. 2.

BY F. E. WELLINGS

high cards—North Africa or Middle East?

Middle East Geology

The oil reservoirs of the Middle East are pretty well known. There are not many countries in the world where 40 miles of oil field was proved with 20 wells as on Kirkuk by 1930; or a 10-billion-barrel reserve estimated with 9 wells as on Burgan in 1940; or where second stepouts were 10 miles away as on Dukhan, Zubair, Ghawar, et al.

Middle East oil fields have long been famous for:

- Size of pools.
- Production from individual wells.
- Reserves.

And this is generally agreed to be due to a most favorable combination of criteria, viz.:

- Large closed anticlines, surface and geophysical.
- Good permeability cap rocks of shale or anhydrite.
- Highly porous, permeable, and thick reservoir rocks of limestones or sandstones.

One may add thick source sediments, as exposed in the Zagros Mountains of Iraq and Iran, where seepages and other surface oil indications are also plentiful. There are no obvious thick mother rocks on the west or desert side and no live seepages, and nobody knows exactly why this side of the Arabian shield has been so favored with prolific oil pools.

Not counting the first 6 wells at Dammam to the nonproductive Bahrain Zone, Aramco has had only 4 dry holes for 13 oil discoveries in a total of 340 wells drilled. Kuwait has had only 2—but the Sahara already has 140 dry holes out of 360 wells drilled.

Origins in doubt. One of the possible answers to the problem of the origin of all this oil is hidden under the Mesopotamian-Gulf geosyncline (Fig. 4), about which we know very little, due to the lack of drilled holes in the marshes and the sea bed. Geologists assume that its axes have migrated to and fro in the past, but their knowledge of it is largely based on wells drilled on structures along its desert and mountain flanks. It may well be that its bottom is the main source of the oil, and that its movements are more significant for oil formation and migration than those of the mountain and foreland folds which have been mapped.

Oil is a normal constituent of marine sedimentary rocks, but the early stages of conversion of organic matter—animal and vegetable—into oil are still largely unknown. The later stages of migration and accumulation must be highly selective to give large deposits in some Middle East countries and little, or none at all, in others.

Another point to remember is that more oil has been dissipated by erosion there in past geological ages than is left for development today, and that some of our present fields with copious seepages owe their preservation to accidents in time. Burgan field has less than 100 ft. of cap-rock shale on its crest so it has been said that it is a giant oil field only by the grace of God—or Allah.

Geology unlike Africa. There are major differences in geology between

the Middle East and North African oil provinces. The oldest producing formations in the Middle East are Paleozoic Nubian sandstones in the small Gulf of Suez fields, and the Triassic limestone in Butmah 2, also a small well, in northern Iraq. Jurassic limestones hold the huge reserves of Saudi Arabia and those of Qatar. The big production of Kuwait and Basrah comes from Middle and Lower Cretaceous sandstones and so does the Wafra and Safaniya oil. Cretaceous limestones are productive at Karatchok in Northeast Syria, Ain Zalah in northern Iraq, Kirkuk, South Iran, Basrah, Wafra, Manifa, Bahrain, Umm Shaif, and Murban. The big fields in northern Iraq and southern Iran are in Tertiary limestones.

It has been estimated that Middle East reserves are fairly equally divided among Tertiary, Cretaceous, and Jurassic, one-third to each period.

In the Sahara, the main oil reserves are in Paleozoic sandstones, and in Libya so far they are in the overlying Upper Cretaceous and Lower Tertiary limestones. In both these countries wells go from Tertiary to basement in 12,000 ft., so there is nothing like the thickness and volume of sediments of the Middle East geosyncline where some 20,000 ft. of continuous sedimentation is recorded for Tertiary and Mesozoic on the desert side, and more than 30,000 ft. in the mountain-front folds (see Fig. 3).

The distance between the northernmost fields at Ramandag, Karatchok, and Ain Zalah to the southernmost in the gulf is 1,200 miles. The area of prospective oil territory in the Middle East is some 600,000 sq. miles and this excludes a lot of Sinai, Israel, Jordan, Lebanon, Syria, Turkey, Iran, Saudi Arabia, Oman, and Hadhramaut. Of this total, about one-quarter has been prospected by drilling more than 1,000 exploratory wells.

The relationship between area and reserves does not usually hold good. In the hands of geologists the ratio between volume of sediments and probable reserves is sounder, but it breaks down on account of the selectivity factor already mentioned. Kuwait is the richest on this score, but there is no reliable yardstick, though reserve estimates are continually being improved by the growth of geologic knowledge and the development of scientific methods.

The volume of sediments in the Middle East is about 1,000,000 cu. miles which give a ratio of 24,000 tons of oil per cubic mile or six times that of the U.S.A.

Exploration in the Middle East

The early discoveries in Southwest Iran and North Iraq were based on surface geology and active oil seepages along sinuous Miocene anticlines, complicated by thrust faults and salt tectonics. The reservoirs were thick, fractured, and porous lower Miocene, Oligocene, and Eocene limestones under anhydrite cover, and the stratigraphic succession down to the Paleozoic was exposed in the mountains behind. Wells were shallow and prolific and most of the oil fields are still producing under natural flow. No such surface anticlines are found in North Africa or even in Arabia.

The core of Arabia—and the heart of the matter—is the basement shield of Saudi Arabia with its aureole of continental Nubian sandstones over which from earliest Mesozoic times marine sediments have been deposited during several transgressions and regressions. This shield has been severed from its African counterpart, Nubia, by the Red Sea rift valley, and the southern coast of Arabia from Aden to Dhofar is also bounded by basement rift faults (see Fig. 4). The Oman range is geologically foreign to Arabia, like the Atlas to the heart of Africa.

The regional unconformity between transgressive Mesozoic limestones and Lower Paleozoic sandstones which blankets all North Africa and extends into Sinai, Jordan, and western Arabia, is also found in southern Arabia from Yemen through Hadhramaut and Dhofar to Oman.

In these last countries the search for oil is complicated by salt of probable Cambrian age which has formed piercement plugs in Oman.

Early search led to a rush. Oil exploration in Arabia was touched off by the discovery of oil at Bahrain in 1932. This was the first oil older than the Tertiary limestone of Iran and Iraq to be found. It led to the "oil rush" in the gulf and the acquisition of concessions in Kuwait, Saudi Arabia, Qatar, Trucial Coast, Oman, and Hadhramaut. Bahrain is an elliptical dome in Eocene limestones and shales with a bitumen pit. Dammam and Dukhan are similar Eocene anticlines.

Bahrain Petroleum Co., Ltd., discovered the Middle Cretaceous Bahrain pay but it never amounted to much until augmented 20 years later by Safaniya and now recently by the Japanese Arabian Oil Co.'s strike in the sea bed off the Kuwait Neutral Zone. No Cretaceous-sand production has been found south of Bahrain.

It was Arabian American Oil Co.'s predecessors who made the big strike, the Upper Jurassic Arab zone, in 1938 at Dammam and Abqaiq, followed closely by Dukhan in 1939-40. Since then Aramco has tapped enormous reserves in the Ghawar and Khurais anticlines. Nothing like these prolific Arab zone limestones has been found elsewhere around the Arabian shield.

The first geophysical discoveries in the Middle East were Burgan and Zubair. They were found by gravity surveys followed by reflection seismic work. These successes were repeated at Rumaila, Raudhatain, and in the Kuwait Neutral Zone. In Saudi Arabia, structure drilling to shallow Eocene markers following gravity leads has proved to be more effective than seismic, and most of Aramco's inland fields have been found by this method. Offshore, marine seismic has been mostly responsible for the successes in and along the gulf.

Because of the number and variety of oil reservoirs under the foreland belt of Iraq and Saudi Arabia, surface exploration is being supplemented by stratigraphic drilling on geophysical trends and noses. This has resulted in several new productive zones.

A most intensive drilling campaign has been carried out in Dhofar where 16 wells, most of them deep, have been drilled by Cities Service Oil Co. without finding commercial production.

Oman has had three deep dry holes, and along the Trucial Coast, another Iraq Petroleum Co. associate drilled five dry holes in addition to three successful ones on Murban.

New discoveries. Following is a list of discoveries during the past year, from west to east:

UAR (Egypt)—Two small fields, Ras Bakr and K'Reim on either side of Ras Gharib along the Gulf of Suez.

UAR (Syria)—Souediye 1, 10 miles south of the Karatchok field, tested 700 bbl. per day in the same Upper Cretaceous limestone reservoir.

IRAQ—The Upper and Middle Cretaceous limestones have proved productive under the Hassan field as under the Baba Gurgur dome at Kirkuk.

IRAN—Ahwaz 6 was said to be a 10,000-bbl. per day well and Binak 1 a 4,000-bbl. per day well, both from Cretaceous. Sarajeh is said to be a promising find, southeast of Qum.

KUWAIT—The Minagish well, 20 miles west of Burgan, was reported as a 10,000-bbl. per day producer from Lower Cretaceous sands.

NEUTRAL ZONE—The Japanese Arabian Oil Co. reports a second 6,000-bbl. per day well offshore in the gulf from 5,000 ft. on a marine seismic structure 40 miles northeast of Safaniya and in the same Lower Cretaceous sand pay, 26° oil. The development program calls for nine

wells this year and export at 40,000 bbl. per day by 1961.

SIRIP—This Italian company apparently has a 3,500-bbl. per day well at 7,500 ft., the fifth offshore find and also a seismic find.

QATAR—The second offshore well on Id es Sharqi is reported productive in the Lower Jurassic limestone, which makes the sixth offshore success and the third this year, again seismic.

ADMA—Umm Shaif 3 is a 5,000-bbl. per day well also from the Lower Jurassic at 9,500 ft., and development plans have been announced for production in 1962.

TRUCIAL COAST—Murban 3 is another well in the Lower Cretaceous limestone which first tested oil in No. 1 and is the upper productive zone at Umm Shaif, all 40° oil.

There are now 10 exploratory rigs in and along the gulf.

North African Exploration

There are three good reasons for the delay in exploring the North African deserts for oil.

- Lack of surface structures and oil indications.
- Remoteness, and terrain difficulties with sand dunes and land mines in Libya.
- Political.

Modern facilities of motor and air transport, and especially air conditioning, make life much less rigorous in the present-day geophysical and drilling trailer caravans.

Oil laws of the Sahara and Libya were drawn up to encourage exploration and development by relinquishment obligations and 50-50 division of profits. Now, similar concessions have been granted in the Spanish Sahara, 1,000 miles from the nearest discovery in Algeria; and concessions also have recently been offered by the UAR for 120,000 sq. miles of the western desert of Egypt, where the Sahara Oil Co. drilled nine deep dry holes and spent $40,000,000 before giving up its concession 2 years ago.

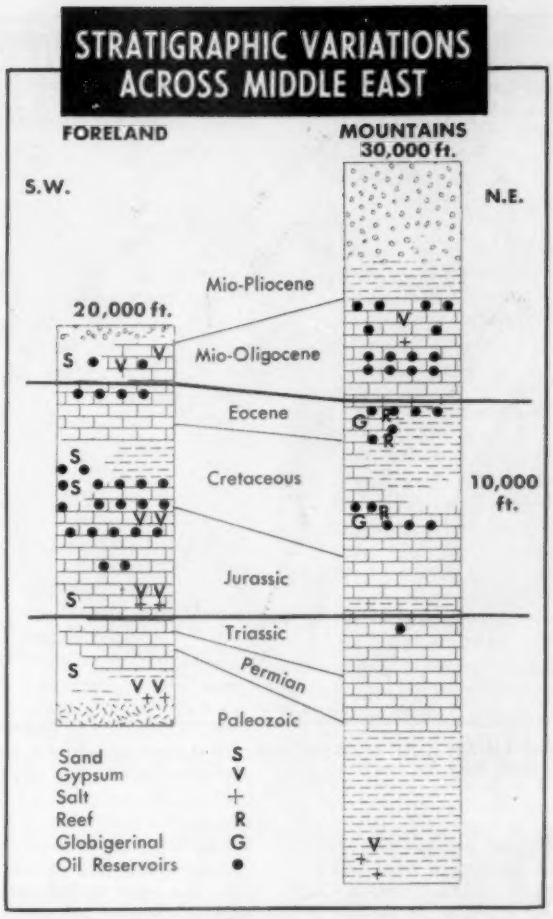
The distance between Hassi Messaoud field and the easternmost Libyan strike is about 1,000 miles, but the width of the prospective belt from the Nile to the Atlantic is 3,000 miles.

Concession terms less attractive. The Sahara (800,000 sq. miles) and Libyan (700,000 sq. miles) deserts are comparable in size with those of Saudi Arabia and Iran, five times the size of Iraq, and 100 times bigger than Kuwait and Qatar, but the concession terms are very different.

In the Middle East countries, large and small, the old concessions are long-term, 60-75 years, with no relinquishment except Aramco's 7½% every 5 years and the consortium's 20% after 25 years.

Algerian permits are limited in size to 50,000-60,000 sq. miles with 50% relinquishment after 5 years, and a reduction to a quarter after 5 more years. The first Sahara permits totaling 200,000 sq. miles were granted in 1953, so the first relinquishments were in 1958, and discarded pieces have been taken by competitors who now number 23 companies (including 6 foreign) holding 75 permits covering 250,000 sq. miles.

Libyan concessions are limited to 12,000 or 30,000 sq. miles with 25% relinquishment after 5 years and 8 years, and reduction to a third or a quarter after 10 years. The Libyan Petroleum Law, which was drafted with the help of interested foreign oil companies, was enacted in July 1955, and by the end of that year, 47 concessions totaling 180,000 sq. miles had been granted to nine different companies; these are subject to first relinquishment at the end of this year. There are now 84 concessions among 14 companies, all foreign, covering three-quarters of the land area and including some offshore acreage.



MIDDLE EAST OIL RESERVES are divided fairly equally among Jurassic, Cretaceous, and Tertiary . . . about one-third to each period. Fig. 3.

Algerian geology. Algeria is a huge country, almost 900,000 sq. miles, nearly as big as Saudi Arabia; of this, the Sahara makes up 90% and Barbary 10%. The main structural framework of the country comprises:

- **The Atlas Mountain complex** exposing mainly Tertiary, Cretaceous, and Jurassic limestones and marls which rest on basement at Algiers and other outcrops. There are two ranges, the Coastal Atlas and the Sahara Atlas, both rising to 7,000 or 8,000 ft., separated by the intermediate plateau of younger sediments up to 3,000 ft. high.
- **The Sahara Desert** with some large dune areas, the east and west ergs covered with recent deposits.

THE MESOPOTAMIAN GULF GEOSYNCLINE is believed to hold the secret of the origin of Middle East oil. Its bottom may well be the source of the oil. Fig. 4.

• **The Hoggar mountains** of folded and faulted Paleozoics lying south of an escarpment of transgressive Cenomanian, and forming an aureole belt in front of the basement. Folds trend northwest, north, and north-northeast.

Algerian exploration. Most of Algeria was covered by air photographs and the geological succession in the interior or Sahara Atlas was established after the war. But it was not until 1952 that the Hoggar was examined by oil geologists who confirmed the existence of thick Paleozoic sediments on the west and south sides of the desert.

Although no seepages or other oil indications were found, the Sahara was considered to be a basin and worth taking permits over and starting geophysical exploration. The Devonian sandstone was fancied as a reservoir between Upper Devonian shales and Silurian source beds, but the Cambro-Ordovician arkoses were hardly considered. Before this there had been small sporadic production in the Algerian and Moroccan Atlas but on the whole disappointing.

The first survey methods were geological, air photography, and gravity, followed by seismic reflection. But nothing much came out of either except Edjele and other Paleozoic surface structures.

The first well at Berga on a surface feature struck gas in the Devonian. The first wells drilled on geophysics were stratigraphic tests and these provided the surprise of a thick Mesozoic sequence, especially of Triassic evaporites and reservoir sands with a big unconformity over the Lower Paleozoic sandstones.

Besides providing cap rock, the presence of the unconformable Triassic evaporites explained why the air photos, gravity, and reflection seismic did not reveal the buried structure shown later by refraction seismic.

It is now said that magnetic surveys show the basement uplifts underneath the known Hassi Messaoud and Hassi R'mel domes, more in accord with the seismic refraction profiles. So new permits are being covered by aeromagnetic surveys.

The first oil discovery at Edjele was in January 1956. The well made 500 bbl. per day of 37° oil at 1,500 ft. in Carboniferous and Devonian at 2,500 ft. under a faulted surface anticline.

This was closely followed by the Hassi Messaoud well in July, with 12,000 bbl. per day of 45° oil from Cambrian sandstones at 11,000 ft., based on refraction seismic profiles.

The big Hassi R'mel gas field was found in the same year in Triassic sands at 8,000 ft. The next oil strike was in 1959 at El Gassi in Cambrian and also by refraction seismic, and the latest is Ohanet, 100 miles north of Edjele.

Hassi Messaoud is one of the world's giant oil fields, with recoverable reserves estimated at about 2 billion barrels from 50 wells. Its first throughput at 100,000 bbl. per day in the new $100,000,000 24-in. pipeline reached the Bougie terminal in November 1959, 3 years after discovery, which is a fine achievement. It is expected to be pumping 200,000 bbl. per day soon and the full capacity of the line in July 1961, but these increases naturally depend on the performance results from present production.

Export from the Edjele-Zarzaitaine fields is expected to begin about October 1960 at 150,000 bbl. per day when the 24-in. pipeline to a terminal at El Skirra near Gabes is finished.

Plans are being studied for piping Hassi R'mel gas to coastal towns and even under the Mediterranean to Sicily and Spain.

Of the four original permit holders, three—CFP (A), SN REPAL, and CREPS—have found commercial production and only CPA (65% Shell) is unlucky with only gas. Now it is being said, and it is superficially true, that the successful ones picked the easy areas between the dunes first as there have been no big discoveries far away from the known fields.

More permits have just been taken over the eastern dunes and altogether there are 45 rigs (25 development and 20 exploratory) and 25 seismic crews active. The total expenditure is about $2,000,000,000 and is now running at $300,000,000 per year, $200,000,000 for development, and $100,000,000 for exploration.

A total of 360 wells was drilled to the end of 1959, of which 200 were deep, 220 were producers, and 140 dry holes. This is more dry holes than were drilled in the Middle East (excluding Egypt) before the war, and more wells than in Kuwait or Saudi Arabia to date. About 700,000 ft. was drilled in 1958 and 1,000,000 ft. in 1959, which is more than in the entire Middle East in those years. A wildcat to basement at 12,000 ft. takes 5 months, and a completion at Hassi Messaoud to 11,000 ft. 4 months.

Hassi Messaoud field is about 30 miles long by 20 miles broad, a gentle dome trending north-northeast-south-southwest, and its reservoir consists of Cambrian sandstones 300 ft. thick, overlain unconformably by Triassic sandstones and evaporites. Underneath come 1,000 ft. of unproductive quarzites which rest on basement granite. Porosities are fairly uniform but per-

meabilities vary and there is some fracturing.

As usual, the origin of the oil is puzzling. It is stored in the Cambrian now but this is unfossiliferous and nonmarine continental. It could have migrated from fossiliferous Silurian or Devonian shales overlying farther into the basin, but the Cambrian sandstones were subjected to prolonged uplift and erosion in Upper Paleozoic and Lower Mesozoic time and any oil would have been lost. The alternative explanation is that the reservoir sands were charged with oil from the overlapping Triassic shale at Hassi Messaoud and with gas at Hassi R'mel.

At Edjele and Zarzaitaine the Carboniferous and Devonian oil could have its origin in those formations, which are marine and fossiliferous.

Libyan geology. The area of Libya is some 700,000 sq. miles; it is mostly desert and infested with more than a million land mines. Already, more party months have been spent on mine clearance than on all geophysics put together.

Apart from the Palaeozoic structures deep in the interior and the Mediterranean coastal belt there is not much surface geology to be done and the structural framework is not so apparent as in Algeria.

Behind Tripoli is a Miocene fault scarp cut back to expose the Mesozoic; Jebel Akhdar, east of Benghazi, is another broad gentle Miocene uplift. In the west along the 28° parallel is an interior fold axis trending east-northeast-west-southwest, and exposing basement and Paleozoic Nubian sandstone.

In the south, and analogous with the Hoggar in Sahara, are the Tibesti mountains, also exposing basement schists and Paleozoic sandstones with spurs running north-northwest and north-northeast under the overlapping Mesozoic sandstone and shales.

The Paleozoic seas covered most of the country and retreated in Carboniferous time, leaving continental Nubian sandstones and a major unconformity as in the Sahara.

The best defined basin is that of Sirte, with more than 10,000 ft. of Tertiaries; along its flanks occur the Zelten and other discoveries in Cyrenaica where wells go into Paleozoic sands below Cretaceous and then into basement. The structures trend northwest-southeast, which is at variance with the east-northeast trend of the Atlas and of the interior folds in Paleozoic.

Geologists in Libya agree with those in Algeria that the Atshan oil is probably indigenous to the Carboniferous and Devonian in which it is found, but they believe that the oil occurring in the Sirte basin is indigenous to the Paleocene, whether found in Upper Cretaceous or Paleozoic. It is different from the Sahara oil, heavier and more sulfurous.

The occurrence of oil in different formations above and below this major unconformity suggests its function as a carrier plane. The regional geology under this unconformity is variable and every wildcat well is a surprise—a pleasant one if it finds oil.

There appear to be evaporites in Jurassic as well as Triassic and their presence calls for refraction seismic as in Sahara. The existence of igneous sills in the Cambrian and of oil in basement granite add to the problems.

Libyan exploration. During the first 3 years, 1954-56, the greater part of Libya had been covered by geology, air photography, airborne magnetometer, and gravity. Generally speaking, gravity gives reliable leads in Tertiary and magnetic in Paleozoic. Seismic activity has increased to 42 crews.

Shows of gas and oil had been struck in water wells, but the first discovery of oil was in December 1957. At Atshan, the discovery made 500 bbl. per day of 45° oil in Devonian sandstone at 2,000 ft., below a surface anticline exposing Carboniferous beds. It lies about 60 miles southeast of Edjélé, the French Sahara's discovery well of 2 years before.

The next strike, in the summer of 1958, was at Bahi in the Sirte Desert of Cyrenaica. There was a flow of 700 bbl. per day of 35° oil from Upper Cretaceous limestone at 5,800 ft. This was followed in December 1958 by a better well at Dahra, with 1,000 bbl. per day from Paleocene limestones at 3,800 ft.; both were on seismic structures.

The first big well was Zelten 1 in June 1959. This giant flowed 17,500 bbl. per day from 200 ft. of Paleocene shelly limestones at 5,500 ft. It was quickly followed by Zelten 2 for 15,000 bbl. per day, also 37° oil and 4½ miles away. It was located on seismic profiles across a broad gentle surface anticline in Miocene limestone. Zelten 3, 4, and 5 are smaller wells in Upper Cretaceous limestones at 7,000 ft.

Zelten is only 100 miles from the coast, and already surveys are in progress for a pipeline and terminal at Mersa Brega and a 4¼ million-dollar order for 30-in. pipe has been placed for delivery this year.

Also in this area are the lesser strikes of Caltex at Beda, 3,650 bbl. per day in Upper Cretaceous; Libyan-American's 2,500 bbl. per day in Paleocene at Mabruk; the easternmost well at Amal, 865 bbl. per day from Paleozoic by Mobil; and just recently Mobil's 1,500 bbl. per day well at Hofra from 3,000 ft. Already there are 18 producers in this Sirte basin.

Other smaller discoveries in the west are Shell's Tlacsin and Gulf's Emgayet, both in Silurian, and another one by Oasis.

So far 75 wells have been drilled, with a total footage of 400,000 ft. Of these wells, 15 have struck oil, a ratio of 1 in 6 wildcats, which is very good. There are now 32 rigs operating, half on contract.

A completion to 5,000 or 6,000 ft. takes 2 months and costs $500,000; a wildcat to 12,000 ft. takes 5-6 months and costs $1,000,000. Total expenditure to the end of 1959 was $250,000,000, which is more than has been spent to date by nonproducing companies in the gulf and southeast Arabia.

Conclusions

As much oil and probably more could be found in certain Middle East counties with the drilling effort now being deployed in the Sahara and Libya. But these North African discoveries have come at a time when the world's proved oil reserves are greater than ever before, relative to production as well as absolutely. Because the margin of spare capacity was tight for 10 years after the war, the petroleum industry trebled its exploration and capital expenditures with the result—given the incentive and the skill of the operators—that it was too successful too soon. There is now a large excess of crude productive capacity and a substantial surplus of shipping and refining which is expected to last for several years.

The recent Robinson Commission report foresees that western Europe's total oil demand will continue to rise by 50-80 million tons to 200-240 million tons by 1965, broadly confirming the long-term forecasts made by the Hartley Commission in 1956. But the Robinson report emphasizes that the consumer's choice will be the lowest-cost fuel.

In 1959, the Middle East's increase in production over 1958 was 7.7%, the same as the world's increase, 7.6%, and it also maintained its share of world production, 23%.

The next 2 years' exports from Sahara can probably be absorbed in France, but when Libya comes on production, North African capacity might amount to 50 million tons per year by 1965 and compete with the Middle East—and the USSR—for the European market.

ABBREVIATED COMPARISON OF ADSORBENTS
TABLE 1

Adsorbent—	Weight fraction H_2S adsorbed*	Contact time, sec.	Remarks
Molecular sieve 4-A	0.028	41.9	Difficult to regenerate without ruining column.
Molecular sieve 5-A	0.032 0.041	45.5 125.0	Excellent properties both on short and long runs.
Molecular sieve 13-X	0.038 0.033	41.5 123.0	Bed easily fouled. Results not dependable.
Activated charcoal	0.012	127.4	Low results.
Mobilbeads	0.001	80	Practically no capacity for H_2S.
Activated alumina	0.013	42	Impossible to regenerate. Seemingly some chemical reaction.

*At 26° C. and atmospheric pressure.

This adsorbent may provide a

Practical way to sweeten natural gas

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A SMALL-RESERVE sour-gas well with a high carbon dioxide (CO_2) content may be uneconomical to produce by presently used sweetening processes. However, the development of a process for sweetening by selective adsorption may make such production commercially feasible.

Experiments were conducted on a number of adsorbents to determine their ability to selectivity separate hydrogen sulfide (H_2S) from the other components of natural-gas streams. The criterion of value was the quantity of H_2S adsorbed by the bed before breakthrough. Of special interest was the quantity adsorbed from gas streams having a fairly high CO_2 content, above 2%, because selective adsorption becomes economically competitive for this type of gas.

Also, in order to qualify, the adsorbent must be easily regenerated, that is, the adsorbed gases driven off and the adsorbent restored nearly to its former degree of affinity for H_2S.

Based on these criteria, adsorbents of the molecular-sieve type gave the best results of those tested. (See Table 1.) Molecular sieves Nos. 4-A, 5-A, and 13-X were supplied by Linde Co. in the form of small cylindrical pellets approximately 1/16 in. in diameter and ¼ in. long. No. 13-X was a nearly cubical molecule of sodium-substituted alumino-silicate while the No. 5-A was a 30% sodium—70% calcium substituted alumino-silicate. A comparison of the static adsorption capacities is shown by experimental data of the manufacturer, Fig. 1.

Although No. 13-X had the highest static and initial dynamic capacity, it gave trouble through oxidation of the adsorbed hydrogen sulfide to free sulfur thus fouling the bed. This happened even when changeovers were made in a natural-gas atmosphere. Therefore most of the experimental work used the molecular sieve No. 5-A.

Later work with pilot units indicated that sulfur fouling of the bed was not a problem and that No. 13-A, the marketed version of the No. 13-X, gave better results than the No. 5-A. This had been predicted by the manufacturer.

Naturally occurring zeolites and calcium-substituted natural zeolites showed no observable selectivity for H_2S.

Reason for trying selective adsorption. On an engineering assignment to design a sweetening unit for a small-reserve gas well, one of the writers was surprised to find that even with a completed sour-gas well the company could not economically produce the reservoir. The reason for this was the high CO_2 content, 5% by volume. Conventional units such as the ethanolamine absorption systems cost too much initially when designed to remove that much acid gas. The system which uses iron filings im-

pregnated into a carrier costs too much to operate, and, there is always the danger of fire while changing these beds.

How then could the separation of H_2S and CO_2 be affected? Although similar chemically, excluding prohibitively expensive reactions such as that with cadmium sulfate, there were two differences—molecular size and polarity. Selective adsorption could make use of both of these. An adsorbent with an affinity for polar molecules would tend to adsorb more of the more polar H_2S. Or an adsorbert which had an adsorbing area with passageways small enough to exclude CO_2 while admitting H_2S would effectively separate the two.

The economy and automation made possible by the adsorption system made it look attractive for remote installations.

The problem was thus one of finding an adsorbent which would use one or both of these differences to selectively adsorb H_2S from the CO_2-rich natural-gas stream. Comparison tests made on a number of adsorbents for capacity, selectivity, and regenerative ability showed that the molecular-sieve type gave the best results (Table 1).

There remained the need for evaluating the adsorbent over the range of operating variables that might be expected. It was necessary to find answers to the following questions. What would be the effect on H_2S adsorption of varying (1) temperature, (2) pressure, (3) contact time, and (4) H_2S concentration. How would the ratio of CO_2 to H_2S effect the amount of H_2S adsorbed at breakthrough and how would the presence of water, a more polar substance, effect H_2S adsorption?

"Comparison tests made on a number of adsorbents for capacity, selectivity, and regenerative ability showed that the molecular-sieve type gave the best results."

Method of testing. The adsorbent was placed in a ⅝-in. diameter glass adsorber, maintained at constant temperature. Gas was metered through the bed at a constant rate until the H_2S breakthrough was indicated by reaction with lead-acetate-impregnated filter paper. Comparative tests made in a 1-in.-diameter column showed that enlarging the bed diameter had no observable effect on the adsorptive capacity.

Pressure adsorption tests consisted of passing sour gas from a well (Magnolia Petroleum Co.'s Clayton Ranch), through a bed of molecular sieve No. 5-A or a combination of molecular sieve and Mobilbead, a commercial desiccant. The column was approximately 3-in. in diameter by 6 ft. long and contained 460 g. of adsorbent. The pressure was held constant while the treated gas was measured by a positive-displacement meter and the H_2S breakthrough was determined by lead acetate-impregnated papers in Smiley testers. Fig. 2 shows a diagram of the equipment. One noteworthy difference observed between the regenerated molecular sieves and other commercial adsorbents was the sieves' ability to continue to adsorb some hydrogen sulfide and water even at a temperature of 400° F.

Test results. Data obtained from the atmospheric pressure tests on No. 5-A were used to plot Figs. 3, 4, 5, and 6. Note that in Fig. 3 the weight fraction adsorbed with a gaseous mixture was lower than with the pure component, as shown in Fig. 1, indicating interference by the other molecules.

In Fig. 4, the increased adsorption of H_2S in the dynamic system over that of the static system demonstrates that the less-polar hydrocarbon molecules interfered less than CO_2.

The increased adsorption obtained with decreasing temperature, as seen in Fig. 5, was expected since as the energy level of the molecule decreases, more collisions with the surface become inelastic and fewer molecules have sufficient energy to overcome the adsorptive forces. At lower temperatures, the smaller and more-polar H_2S molecule can enter the internal cavities of the adsorbent comparatively faster and better than the larger molecules. Note here that the adsorptive capacity of the bed was generally higher as the concentration of the H_2S in the inlet stream was increased.

The curves obtained in Fig. 6 indicate that there is very little advantage in designing for contact times in excess of 170 seconds.

Table 2 contains data from the wellhead pressure runs on the molecular sieve No. 5-A. Run No. 39-A used Mobilbead desiccant to remove water vapor before the molecular sieve adsorbed the H_2S. As can be seen, adsorptive capacity of the bed is decreased by the presence of water vapor in the gas. Water molecules displace H_2S and other adsorbed gases.

The effect of pressure on the weight fraction H_2S adsorbed is shown in Fig. 7. This reveals an optimum adsorption pressure of about 450 psia. Such an effect was entirely unexpected.

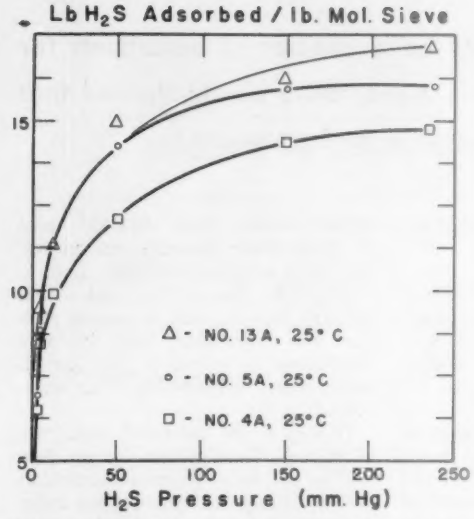
TABLE 2—RESULTS OF WELLHEAD PRESSURE RUNS USING MOLECULAR SIEVE NO. 5-A

Run No.	Temp., °F.	Contact time, sec.	Wt. fraction H_2S ads.	Press., psi.	Mole fraction H_2S in inlet gas
33	96	80.9	0.0167	1,023	0.0016
35	85	91.6	0.0273	521	0.0016
36	82	94.5	0.0249	265	0.0016
38	78	80.6	0.0216	775	0.0016
With Mobilbeads removing water:					
39A	85	91.6	0.031	515	0.0016

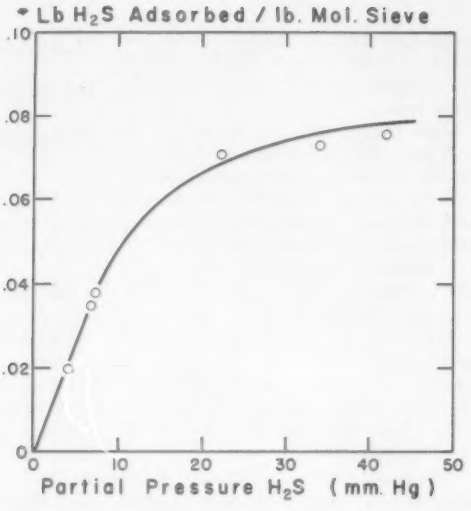
TABLE 3—COST COMPARISON

Case No.	Wellhead pressure (psig.)	Delivery pressure (psig.)	H_2S Conc. gr./100 ft.³ vol. %	CO_2 Con. gr./100 ft.³ vol. %	Vol. del. (M.M.c.f.d.)	Temp. to ads. bed, °F.	Cost of MEA sys. ($)	Cost of selective ads. sys. ($)
1	4,400	1,000	189 0.30	3,120 5.0	12	−20	$175,000	$118,000
2	1,500	1,000	100 0.16	400 0.64	1	79	17,000	25,000
3	1,300	1,000	125 0.2	1,250 2.0	4	86	50,900	41,000
*4	1,300	1,000	125 0.2	1,250 2.0	4	86	50,900	25,000

*Fast cycle.



THESE CURVES show the pounds of H_2S adsorbed per pound of molecular sieve, as the absolute pressure of pure H_2S increases in a static system. (Courtesy The Linde Co.). Fig. 1.



LESS H_2S IS ADSORBED per pound of molecular sieve in a gaseous mixture than with the pure component. Fig. 3.

It appears that the adsorption of some components at higher pressure increases faster than the total bed capacity. This hypothesis leads toward the presumption of a convergent pressure, characteristic of the gaseous mixture, at which the bed would lose all selectivity.

Such a convergent pressure exists in equilibrium data, and Barnes[8] stated that his experience has led him to believe that a similar phenomenon may be exhibited in adsorption at high pressures. Since equilibrium relationships are closely allied with adsorption, such a theory is reasonable.

Practical application. Designing an operational column on such limited experimental data would be very risky indeed. As mentioned above, a commercial model has been tried out and proved satisfactory. Results from this commercial unit will probably soon be published. However, many things need to be considered. For example, very heavy ends could clog the sieve openings and foul the bed.

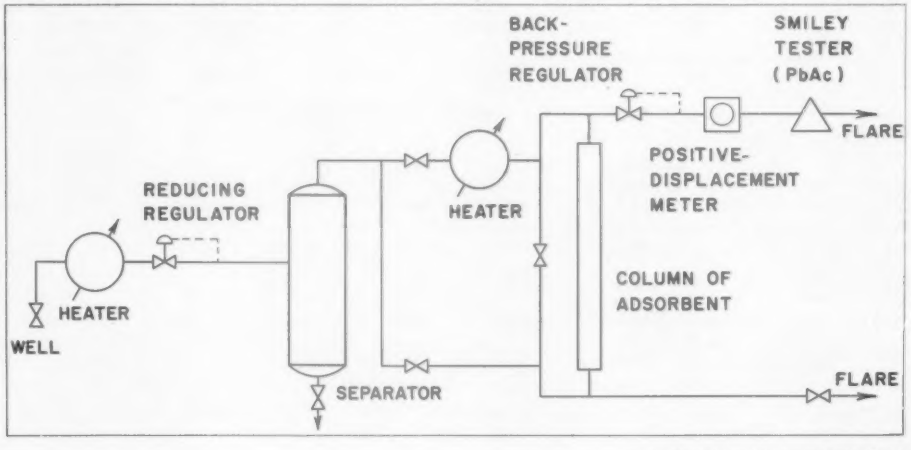
If one does extend this information to practicality, there are cases where the selective adsorption process appears economical. This process is not a replacement, but an extension of existing sweetening methods. Economic studies conducted with the cooperation of the equipment manufacturing companies[9,10] show this very clearly.

To illustrate the point, four cases were estimated on the basis. The cost of a monoethanolamine (MEA) absorption system was compared to the cost of a selective adsorption installation for different gas compositions (Table 3).

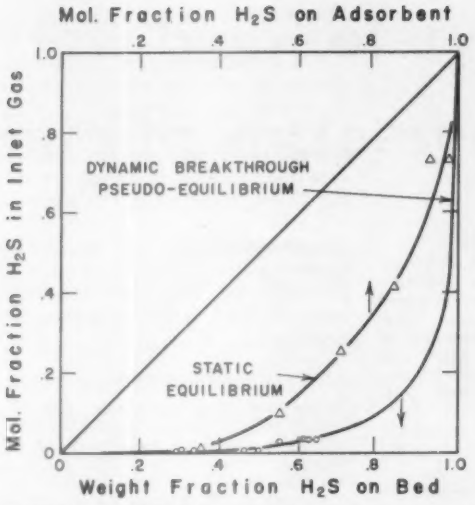
It may be argued that there are cheaper systems being developed than the MEA process; for instance, the hot potassium carbonate[11] or the modified iron filings reaction[12]. But comparative cost literature is available to show how the MEA system will compare.

Take the case of one company, whose reservoir may as well be hypothetical Case I. Suppose it desires a central sweetening plant to handle 12 M.M.c.f.d. of acid gas as shown in Table 3. How do costs compare?

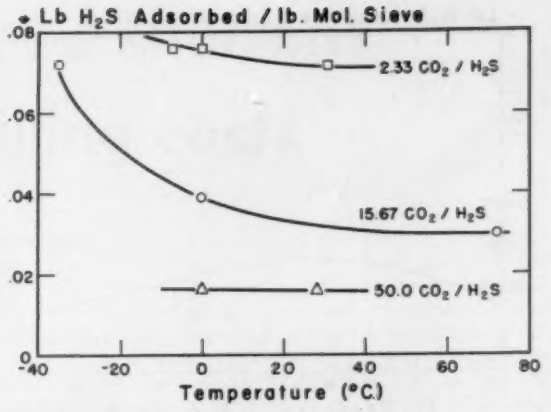
Notice that the wellhead pressure in this case allows flashing to obtain extremely low temperature. In designing a selective adsorption system for these conditions, Figs. 5, 6, and 7 show that about 5 wt.% of H_2S would be adsorbed. That is, 100 lb. of molecular sieve would adsorb 5 lb. of H_2S from the gas stream. Present data indicate there will be about 30% reduction in capacity as the number of cycles increases on the unit. Whether this is incomplete regeneration or heat damage to the molecular structure is academic, (which when translated, means we



PRESSURE adsorption tests consisted of passing sour gas from a well through a bed of molecular sieve No. 5-A. No. 2.



STATIC EQUILIBRIUM curve for H_2S-CO_2 system, and dynamic breakthrough pseudoequilibrium curve for H_2S and CO_2 contaminated natural-gas system. Fig. 4.



MORE H_2S IS ADSORBED per pound of molecular sieve at lower temperatures. Data for these curves were obtained at atmospheric pressure and 15 seconds contact time. Fig. 5.

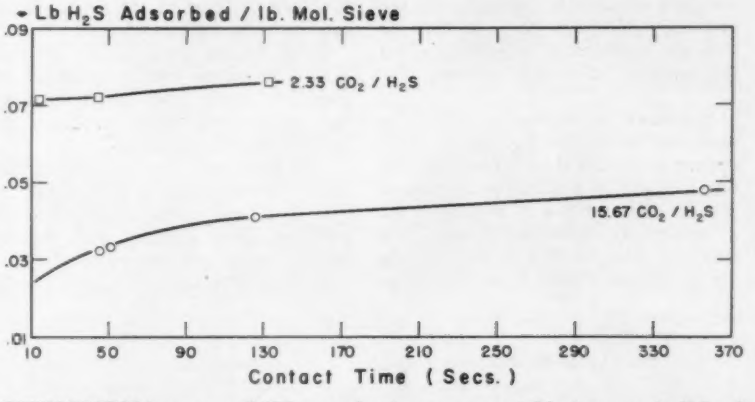
don't know). To be safe, assume 50% and design on 2.5 lb. of H_2S per 100 lb. of adsorbent.

The selective adsorption process would operate essentially the same as solid bed dehydrators. The time cycle could be about 3 hours, and regeneration will probably use 2 to 5% of the total gas throughput. A system such as this would cost approximately \$118,000[5].

An MEA absorption system to handle this same gas would cost about \$175,000[6].

Now consider Case 2 which points up two limitations of the selective adsorption process. In this case it is desired to treat 1 M.M.c.f.d. of gas containing 100 grains H_2S per 100 ft.^{3} of gas, and 400 grains CO_2 per 100 ft.^{3}, or 0.0064 mole fraction CO_2. The delivery pressure is required by contract to be 1,000 psig. and the gas temperature is 79° F. or approximately 26° C. From Fig. 6, the amount adsorbed should be 6.2 lb. H_2S per 100 lb. of molecular sieve. To be conservative design will be based on 3.1 wt. % H_2S adsorbed. Using a 3-hour cycle, this would require 500 lb. of sieve per bed. Adding additional sieve to dehydrate the gas, it is estimated that two 24-in. by 8-ft. beds would be necessary. Heating, instrumentation, etc., would run the cost up to about \$25,000. This is estimated to be about the lowest possible cost for an adsorption unit.

To do the same job would require a \$3,500 glycol unit plus \$500 installation; approximately 107-gal. per hour MEA unit costing \$12,000 plus \$1,000 installation; or a total cost of \$17,000.



CONTACT TIME in excess of 170 seconds give no appreciable increase in H_2S adsorption. These data were obtained at atmospheric pressure and 26° C. Fig. 6.

Here two factors are illustrated. The CO_2/H_2S ratio is too small to hurt the amine absorption unit, and the adsorption unit is too small to compensate for the cost of the relatively elaborate instrumentation.

Consider Case 3. These conditions would require two towers 42 in. by 15 ft. with 4,175 lb. of sieve per bed plus 300 lb. for dehydration plus controls. Regeneration would require about 1,000,000 B.t.u. per hour.

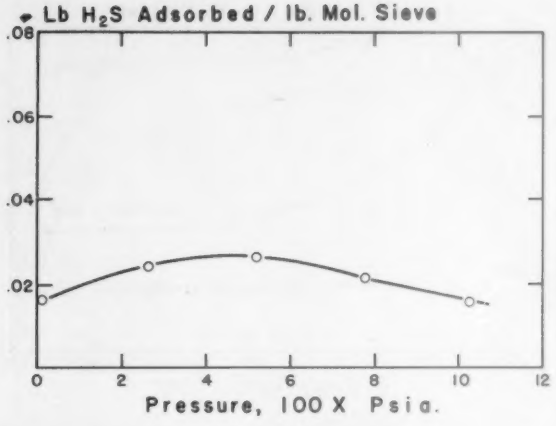
Costs would approximate \$11,000 for molecular sieve, \$20,000 for towers and instrumentation, \$9,000 for heater plus \$1,000 for installing the skid mounted unit. Total cost, \$41,000.

A glycol-amine unit would require \$2,000 for amine, \$38,000 for a 1,200-gal. per hour amine unit (2.5 M.M.B.t.u. per hour), and \$4,400 for a glycol scrubber. Installation here would cost about \$6,500 because this unit could not be skid-mounted. Total cost would run \$50,900.

Another interesting possibility is based on the use of modern fast-cycle units and multiple-barrel adsorbers. For Case 4 consider Case 3 in the light of a three-cycle selective adsorption system similar to that shown in Fig. 8.

Here one bed is adsorbing, one cooling, and one regenerating continuously. This smooths out the gas flow, heater firing, etc. Such a system could operate on 40-minute cycles.

This would mean only 1,060 lb. of molecular sieve per bed, three adsorbers 30 in. by 8 ft., 6 in. plus controls, and a 250,000-B.t.u. per hour heater. The itemized cost would be \$1,400, \$13,000, and \$6,000 respectively, plus \$1,000 installation cost. Total cost, \$21,400. The equipment manufac-



PRESSURE tests indicated an optimum adsorption pressure of 450 psia. These were conducted at 90° F. with approximately 90 seconds contact time. Fig. 7.

turer will probably increase this to $25,000 because of uncertainties and required guarantees. Even so, it looks good compared to the amine unit at approximately $50,000.

While these estimates are very rough and the Case I example was a reservoir admittedly favorable for the selective adsorption process, they do indicate commercial possibilities for the selective adsorption process.

Summary. As mentioned earlier, the molecular sieves No. 5-A or No. 13-A appear to be the most promising material to use in a selective adsorption process. The process at present is not a universally desirable system. For example, heavy ends may tend to plug the molecular sieves. However, it appears to have definite economic advantages:

1. Where the sour gas reservoir has high CO_2 content compared to the H_2S content (any CO_2/H_2S greater than 3.0 may be a prospect).
2. Where delivery is large enough to offset the cost of the fairly elaborate instrumentation required.
3. In remote areas where automation is desirable with a minimum of attendant costs, and where burning the regeneration gases produces no public relations problems.

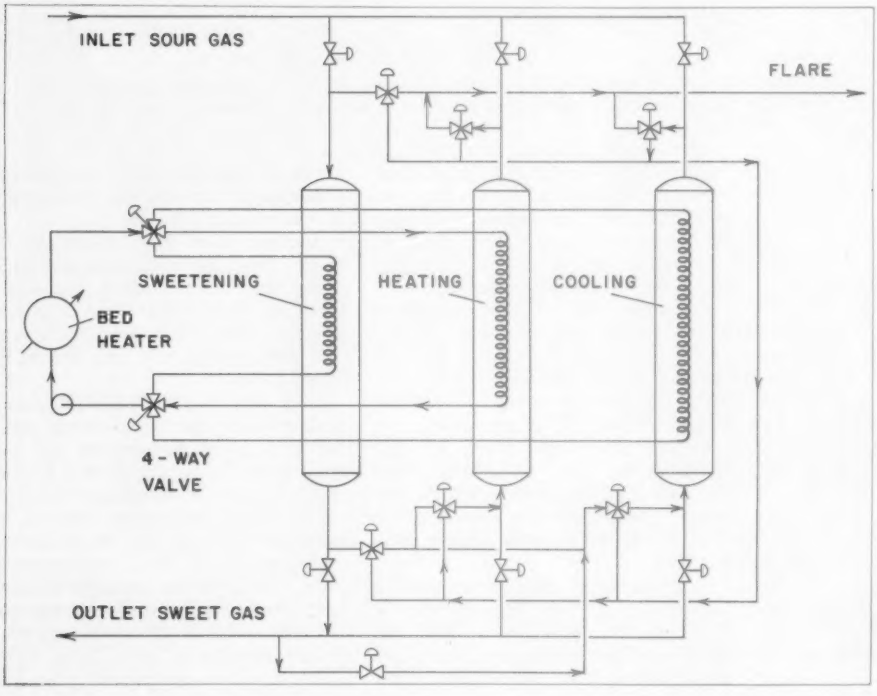
The adsorptive capacity and hence the economics appear even better if:

1. Wellhead pressure and delivery pressure allow flashing with the resulting lower gas temperature.
2. Gas-delivery conditions permit adsorption at the optimum pressure of about 450 psig.
3. Usable dehydration facilities are already in place, as when recompleting a well in a new zone.
4. Existing vessels permit longer contact times (although it does not appear economical to design for contact times greater than 170 seconds).

Acknowledgment. The authors acknowledge the assistance received, in particular the help and encouragement of Ovid Baker, Magnolia Petroleum Co.

Bibliography

1. Moussa, Stan, consultant with Maloney-Crawford, personal communication.
2. Breck, D. W., and Smith, J. V., "Molecular Sieves": Scientific American, Vol. 200, No. 1, Jan. 1959.
3. Breck, D. W., Eversole, W. G., Milton, R. W., Reed, T. B., and Thomas, T. L., "Crystalline Zeolites I": J. American Chemical Society 78, 5963 (1956).
4. Reed, T. B., and Breck, D. W., "Crystalline Zeolites II": J. American Chemical Society 78, 5972 (1956).
5. Brunauer, Stephen, "The Adsorption of Gases and Vapors": Vol. 1, Princeton University Press, 1943.
6. Rao, B. S., J. Phys. Chem., 36, 616, (1932).
7. Thomas, R. O., Magnolia Petroleum Co., personal communication.
8. Barnes, Brunner C., Magnolia Petroleum Co., personal communication.
9. Clark, Ed, Linde Co., personal communication.
10. Fox, Bob, National Tank Co., personal communication.
11. Buck, H. O., and Leitch, Angus, R. S., Petrocon Engineering Co., Natural Gasoline Association meeting, April 17, 1958, Dallas.



MODERN fast cycle units with 3-bbl. adsorbers offer a more economical system for selective adsorption. Fig. 8.

How high rotary speed shortens bit life, increases drilling costs

Rock-bit footage goes down and costs go up at high rotary speeds.

As a result, we do not stand our best chance of reducing drilling costs by going to high rotary speeds. Rather, we should rely on a combination of proper weight on bit with moderate rotary r.p.m. and good bottom-hole cleaning.

BY R. A. CUNNINGHAM
Hughes Tool Co.

These are the conclusions of recent laboratory investigations into how rotary speed affects: (1) rock-bit bearing wear, (2) rock-bit tooth wear, (3) drilling rate, and (4) minimum drilling cost.

Taken separately, the individual effects are as follows:

1. Total bearing revolutions are independent of rotary speed in the range 160 to 1,060 r.p.m. That is, the bearing makes the same number of turns regardless.

2. Amount of penetration for each revolution of the bit decreases as rotary speed increases (assuming there is mud pressure on the bottom of the hole).

3. Where bearings always limit bit life, this lower penetration per revolution at high speeds results in lower footage per bit.

4. Where tooth wear always limits bit life, footage per bit is lower at high speeds because penetration per revolution is lower and because tooth wear is faster.

5. If bit weight is held constant, optimum rotary speed is lower at higher values of bit weight.

6. For a given bit weight, costs will be lower if rotary speed is varied according to a specific program instead of being held constant.

Prompted by turbodrill. This series of laboratory tests was made so that field results with the turbodrill could be better understood. Mostly, the turbodrill uses higher rotational speed but less weight and different bottom-hole-cleaning conditions than does conventional rotary. Generally, use of the turbodrill increased the drilling rate with roller-cutter rock bits. This increase was as much as 100 to 200%.

On the other hand, bit footage with the turbodrill was less than with conventional methods. This decrease was as much as 75%.

Reasons for these increases and decreases had not been clear.

The laboratory tests made on roller bearings to determine the effect on their life caused by rotary speed were made in the rotating range, 166 to 1,060 r.p.m. Individual test bearings were loaded to 8,000 and 16,000 lb. This is equivalent to approximately 25,000 and 50,000 lb. on a 7⅞-in. bit.

Tap water and a bentonite mud containing 15 to 20% sand were circulated through the bearings. Bearings failed in tap water because of bearing-pin spalling similar to that reported by Kind[6]. Failure with the bentonite mud resulted mostly from abrasion.

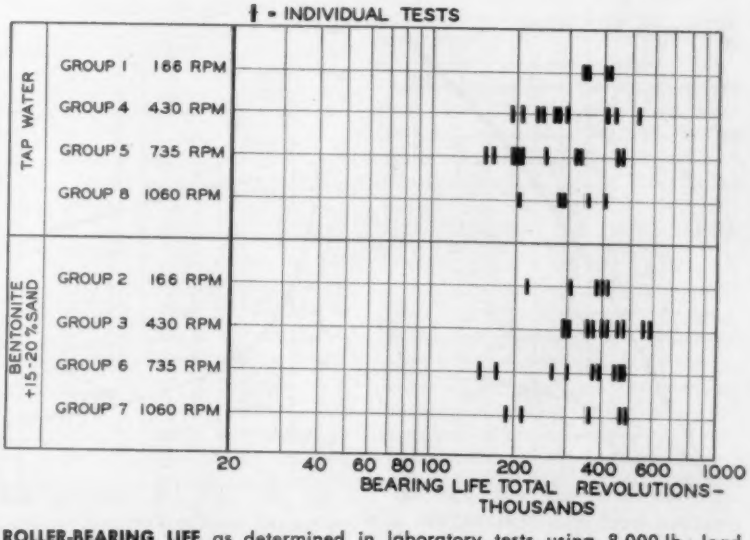
Fig. 1 shows bearing life in total revolutions at 8,000 lb. Since results at 16,000 lb. were similar they are not shown. Considering the normal scatter in bearing tests, the results indicate that bearing life in revolutions is independent of rotary speeds within the speeds tested. This is important in view of the large number of bearing failures associated with high speeds.

Drilling rate tests. Laboratory drilling tests were made using a 1¼-inch diameter bit on small cylinders of gray granite. Rotary speeds varied from 0 to 375 r.p.m. Mud pressure at the bottom of the hole was approximated by pressure applied to both the bore and outside of the sample.

Fig. 2 shows the results. Curve 1A shows that an increase in rotary speed resulted in a proportional increase in drilling rate in mud **at atmospheric pressure.** The penetration per revolution was constant (curve 1B) over the full rotary speed range.

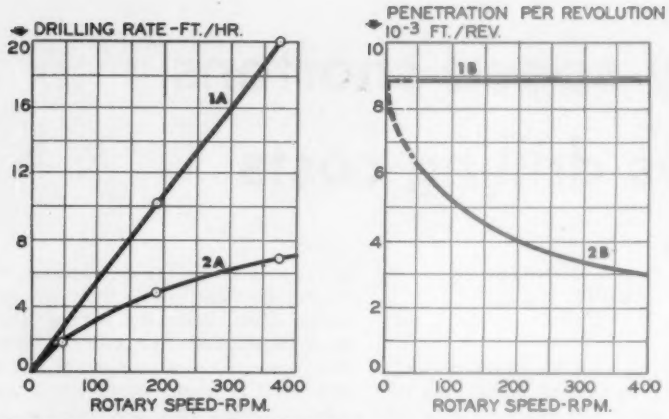
Under mud pressure of 5,000 psi. however, drilling rate was not proportional to rotary speed (curve 2A). Penetration per revolution decreased as rotary speed increased (curve 2B).

Tests on Wyoming Red beds had similar results (Fig. 3). Penetration per revolution was not exactly constant in mud at atmospheric pressure but was nearly so (curve 1B).


INDIVIDUAL TESTS
TAP WATER
GROUP 1 166 RPM
GROUP 4 430 RPM
GROUP 5 735 RPM
GROUP 8 1060 RPM
BENTONITE +15-20 %SAND
GROUP 2 166 RPM
GROUP 3 430 RPM
GROUP 6 735 RPM
GROUP 7 1060 RPM
20 40 60 80 100 200 400 600 1000
BEARING LIFE TOTAL REVOLUTIONS—THOUSANDS

ROLLER-BEARING LIFE as determined in laboratory tests using 8,000-lb. load. Fig. 1.

Paper presented under title, "Laboratory Studies of the Effect of Rotary Speed on Rock-Bit Performance" at 1960 spring meeting of API Division of Production's Mid-Continent District, Wichita.

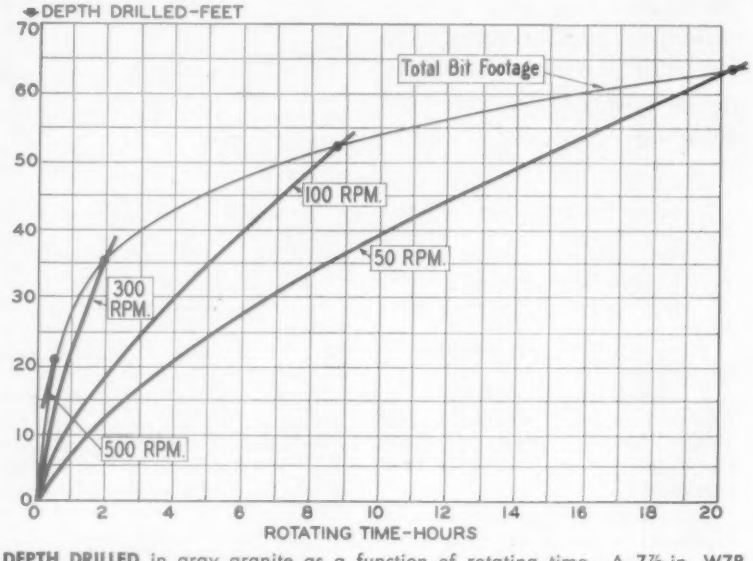


DRILLING RATE AND PENETRATION in gray granite as functions of rotary speed. Tests used lime-base mud; 1¼-in. bit; 3,500-lb. bit weight; pressures of 1 atm. (curves 1) and 5,000 psi. (curves 2). Fig. 2.

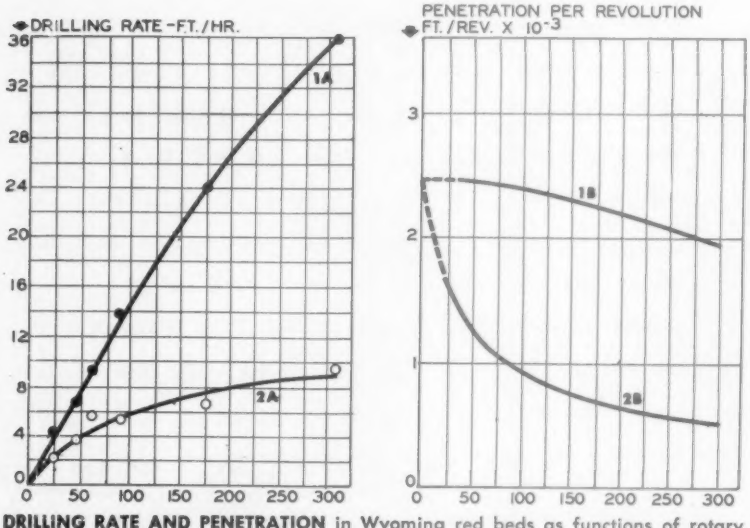
Under 5,000-psi. mud pressure penetration per revolution decreased as rotary speed increased (curve 2B). Field results show similar nonlinear relationships between drilling rate and rotary speed under downhole conditions. [1 2 3]

Effect on bit life. Bearing life in total revolutions is independent of rotary speed. Penetration per bit revolution decreases at increased rotary speed. Hence, at increased rotary speeds, more bearing revolutions are used per foot of hole drilled. If bearings limit bit life at all rotary speeds, then footage per bit is reduced at the higher rotary speeds.

For an example, refer to Fig. 3, curve 2B. The penetration per revolution at 300 r.p.m. is about 0.37 as much as that at 50 r.p.m. Therefore, with the same number of revolutions, bit footage at 300 r.p.m. would be 0.37 that at 50 r.p.m.



DEPTH DRILLED in gray granite as a function of rotating time. A 7⅞-in. W7R bit was loaded to 30,000 lb. Fig. 4.



DRILLING RATE AND PENETRATION in Wyoming red beds as functions of rotary speed. Tests used lime-base mud; 1¼-in. bit; 2,000-lb. bit weight; pressures of 1 atm. (curves 1) and 5,000 psi. (curves 2). Fig. 3.

The relationship between drilling rate and rotary speed shown in Fig. 2 and 3 and the field data cited earlier can be approximated by the equation:

$$V = AwN^a \qquad (1)$$

Where:

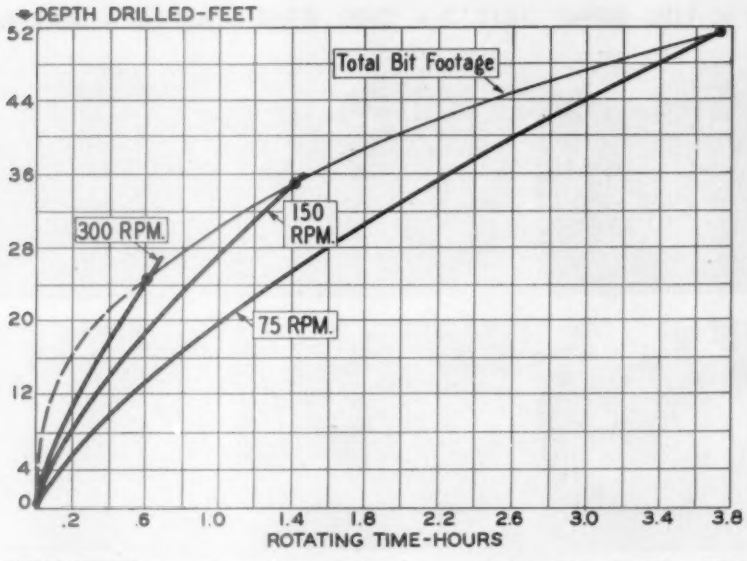
V = drilling rate.
A = constant (Actually, A varies as the bit dulls. We have assumed that the formation is nonabrasive so that A does not change appreciably).
w = weight per inch of bit diameter.
N = rotary speed.
a = constant.

Consider the case where bearings limit bit life. We may use a procedure similar to that used by Graham and Muench[7] to determine the optimum constant rotary speed to give lowest cost per foot for a given bit weight.

It is interesting to examine the results of one such calculation based on drilling medium-hard to hard formation. Assume we are drilling a 7⅞-in. hole, 8,000 ft. deep. A reasonable value of "a" would be 0.45. These results show optmum rotary speed for each of four bit weights as follows: 15,000 lb.—230 r.p.m.; 25,000 lb.—100 r.p.m.; 50,000 lb.—50 r.p.m.; 70,000 lb.—35 r.p.m.

With the heavy weights used in many medium to hard formations, the optimum rotary speeds are close to those now in actual use.

These calculations apply only where formations are very nonabrasive and where bearing failure limits bit life. The next section discusses the case



DEPTH DRILLED in gray granite as a function of rotating time. A 7⅞-in. W7R bit was loaded to 50,000 lb. Fig. 5.

where abrasive wear on the cutting structure limits bit life.

Drilling gray granite. Hughes Tool Co. made a series of tests in its laboratory to determine the effect of rotary speed on wear of bit teeth while drilling abrasive formations. One 7⅞-in. W7R bit was dulled in gray granite at each of the following test conditions:

Weight, lb.	Rotary speed, r.p.m.
30,000	50
30,000	100
30,000	300
30,000	500
50,000	75
50,000	150
50,000	300

Water was circulated at 200 g.p.m., enough for adequate clearing under the atmospheric pressures of the laboratory. Tooth height was measured frequently to determine wear throughout the bit life. Tests stopped when bits were either 0.180 inch under gage or teeth were very dull. In these tests bearings were not a limiting factor to bit life.

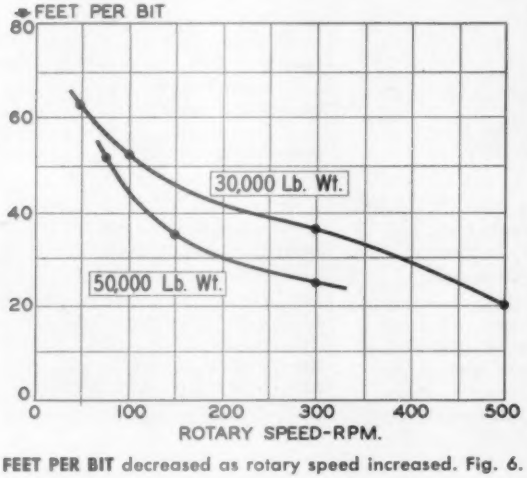
Fig. 4 compares the depth drilled and rotating time for 30,000 lb. at 50, 100, 300, and 500 r.p.m. Fig. 5 does the same for 50,000 lb. at 75, 150, and 300 r.p.m. End of each bit run is shown by a circle; the curve representing total bit footage is drawn through these circles.

Footage per bit decreased drastically as rotary speed increased. For instance, at 30,000 lb. bit weight, footage per bit at 500 r.p.m. was one-third that at 50 r.p.m. At 50,000 lb., footage per bit at 300 r.p.m. was about one-half that at 75 r.p.m.

Fig. 6 is a plot of feet per bit as a function of rotary speed for both 30,000 and 50,000 lb.

You can see the progressive tooth wear of all bits in the Fig. 7. It is evident that, for a given bit weight and equal footage, the teeth were duller at the higher rotary speeds. For instance, compare tooth wear at 30,000 lb. after 15 ft. at 50, 100, and 300 r.p.m. and after 18.8 ft. at 500 r.p.m. At 18.8 ft. and 500 r.p.m. the teeth were very dull.

At 30,000 lb., tooth heights were approximately equal after 64 ft. at 50 r.p.m., after 52 ft. at 100 r.p.m., after 37 ft. at 300 r.p.m., and after 18.8 ft. at 500 r.p.m.



FEET PER BIT decreased as rotary speed increased. Fig. 6.

Drilling rate vs. rotary speed. Fig. 8 was prepared from the original data for the 30,000-lb. test. It shows the relation between drilling rate and rotary speed for different degrees of dullness. It may be seen that drilling rate at any degree of dullness is directly proportional to rotary speed. The tests at 50,000 lb. weight had similar results. In fact, laboratory tests under atmospheric conditions on many different rocks showed this same relationship.

Fig. 9 was also prepared from the 30,000-lb. test. It compares tooth wear per bit revolution with rotary speed for different degree of dullness. When the bit was new, wear per revolution was much greater at increased rotary speed. For instance, at 300 r.p.m. wear per revolution was six times that at 50 r.p.m.

As the bit dulled, wear per revolution still increased with rotary speed, but the rate of increase was less. When the bits were dull, the wear per revolution at 300 r.p.m. was about 1.5 times that at 50 r.p.m.

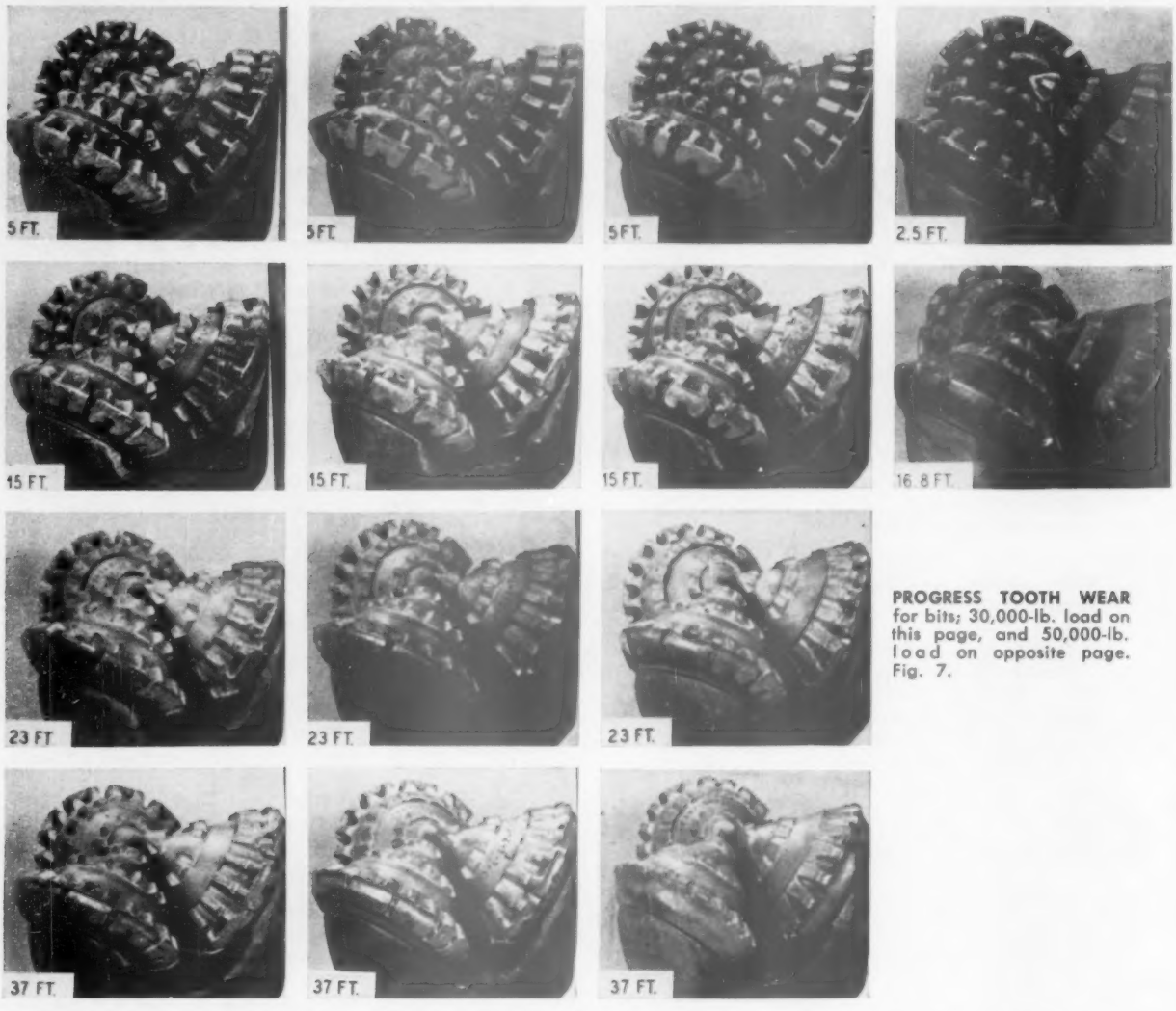
Thus, total bit footage should be decreased at higher rotary speeds because of the increase in wear. The tests at 50,000 lb. weight had similar results.

Correlating with field. Many field tests indicate that penetration per bit revolution decreases with increased rotary speed somewhat as shown by curve 2B, Fig. 2. This is quite different from the results of the granite tests where pentration per revolution did not vary with rotary speed.

Let us speculate that if the granite tests were conducted under high mud pressure, tooth wear would remain essentially the same, but penetration per revolution would be represented by curve 2B, Fig. 2. Then there would be an additional reduction in footage per bit at higher rotary speeds.

For example, in the 50,000-lb. tests we obtained about half the footage at 300 r.p.m. as at 75 r.p.m. From curve 2B, Fig. 2, penetration per revolution at 300 r.p.m. is 0.6 that at 75 r.p.m. Therefore, the expected ratios of bit footage would be 0.5 x 0.6, or 0.3 as much at 300 r.p.m. as at 75 r.p.m.

Calculating cost. Take the common case where cutting structure and not the bearings limit bit life. For this case, we calculated cost of hole drilled



PROGRESS TOOTH WEAR for bits; 30,000-lb. load on this page, and 50,000-lb. load on opposite page. Fig. 7.

based on the results from the 30,000 and 50,000-lb. laboratory tests. Fig. 10 shows these results, comparing cost and rotary speed. We assumed:

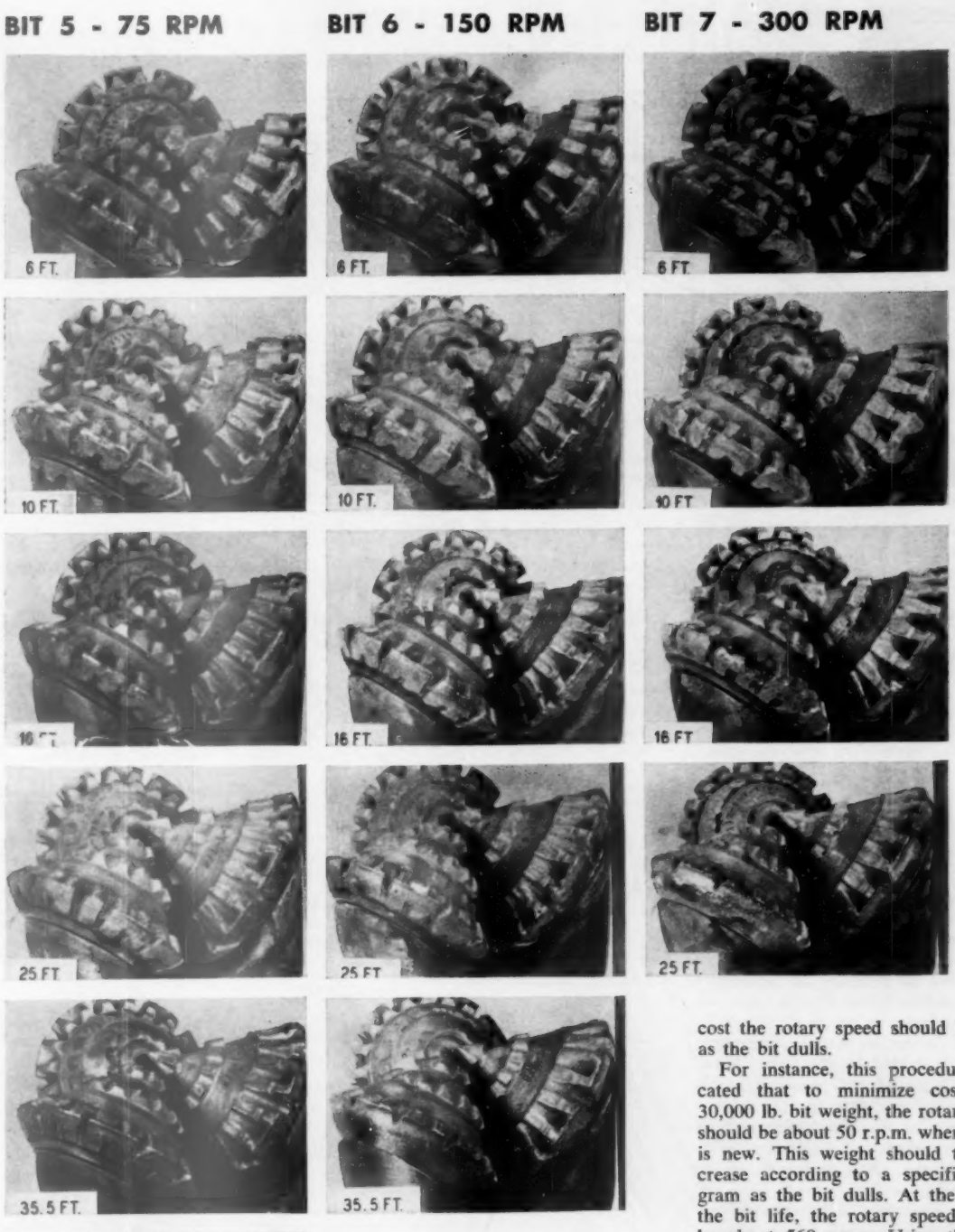
1. Bit cost, $200.
2. Round-trip time, 4½ hours.
3. Rig cost, $40 per hour.

Optimum rotary speed with 30,000 lb. was estimated to be about 200 r.p.m. as shown by the circle point.

At 50,000 lb. the optimum rotary speed was near 75 r.p.m. Drilling rate much below that at 75 r.p.m. would have been too low to be economical. For this reason the curve of Fig. 10 has a minimum cost at about 75 r.p.m. Note the decrease in cost per foot of 17% between 200 r.p.m. at 30,000 lb. and 75 r.p.m. at 50,000 lb.

Seventy-five r.p.m. is close to the speed used in medium hard to hard formations under heavy bit weights.

If tooth wear rather than gage wear had limited footage per bit, the results in Fig. 10 would have been different. The cost at 50,000 lb. and 300 r.p.m. would be equal to or less than at 30,000 lb. and 300 r.p.m. However, it is probable that costs would be



minimum at approximately the same rotary speeds.

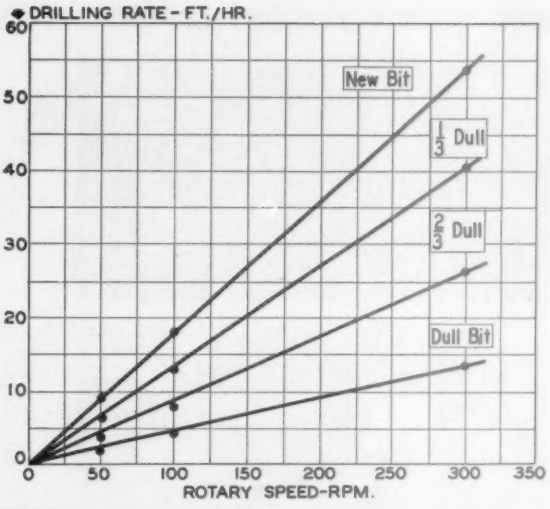
Costs at variable speed. As we analyzed the drilling rate and tooth-wear data, we made a study, using the Calculus of Variations. Object was to see if costs could be lowered still further by varying rotary speed as the teeth dulled.

For the 30,000 pound tests, calculations showed that for lowest drilling cost the rotary speed should increase as the bit dulls.

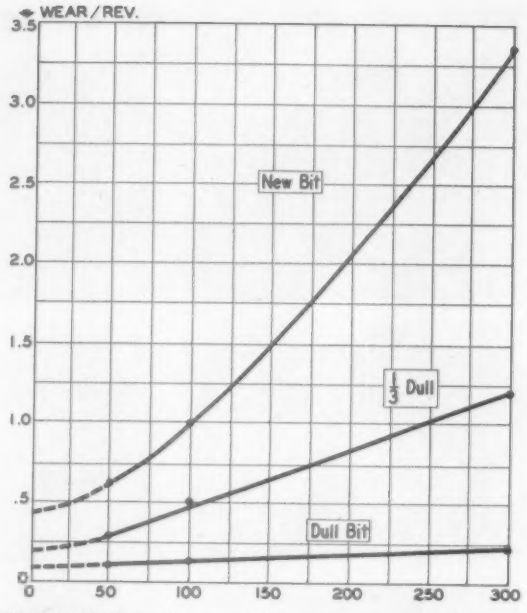
For instance, this procedure indicated that to minimize costs with 30,000 lb. bit weight, the rotary speed should be about 50 r.p.m. when the bit is new. This weight should then increase according to a specified program as the bit dulls. At the end of the bit life, the rotary speed should be about 560 r.p.m. Using this procedure, we estimate, would reduce cost about 9% compared to the best constant rotary speed.

Assume we use the variable rotary speed method but maintain 300 r.p.m., once it is reached. The final cost at the end of the bit run would be essentially the same as if we continued to 560 r.p.m. The difference in cost is about 0.3%.

We made no similar calculations for 50,000 lb. bit weight, because it was



DRILLING RATE falls off sharply as the bit becomes duller. Fig. 8.



TOOTH WEAR per bit revolution decreases as bit becomes duller. Fig. 9.

apparent that drilling rate and tooth-wear data would be needed for a rotary speed lower than 75 r.p.m., and we had no such data.

The following table summarizes results of our analysis to minimize costs while maintaining each of four bit weights.

	Bit weight, (lb.)	Rotary speed (r.p.m.)	Feet/bit	Rotating time, (hours)	Cost, ($)
1.	30,000	†200	41.8	3.5	12.01
2.	30,000	‡50 to 560	45.2	3.25	10.87
3.	30,000	§50 to 300	47.5	3.94	10.90
4.	50,000	¶75	51.3	3.77	9.92

†Optimum constant rotary speed for 30,000 lb.
‡Optimum variable rotary speed for 30,000 lb.
§Same as (‡) except 300 r.p.m. was maintained once it was reached.
¶Optimum constant rotary speed for 50,000 lb.

About this paper. In this report, there are factors we have neglected or minimized in resorting to laboratory testing and analysis. For instance, we drilled granite as an example of an abrasive formation. Actually very little granite is drilled in the field. However, it is a uniform, abrasive formation readily available for the laboratory, and for abrasive characteristics it is representative of a sufficient number of strong, abrasive formations to be of value.

This paper has dealt with two extreme situations—one where bearing failure always limits the life of the bit, and the other where tooth wear always limits the life of the bit. Most actual field cases are in between these two extremes. It is beyond the scope of this paper to study such cases. Since each of the two extreme situations indicated optimum rotary speed in the range now being used, then the optimum r.p.m. for the in-between situation likely will also be in this range.

We neglected the additional costs of rotating at higher r.p.m. for the purpose of our study. These costs which would result from extra equipment or added power requirements should be taken into consideration.

Bibliography

"How to Get the Most Hole for Your Money," by John W. Speer, The Oil and Gas Journal, Vol. 56, No. 13, p. 90.

"How to Increase Your Drilling Rate," by W. R. Waldrup and George E. Cannon, The Oil and Gas Journal, Vol. 54, No. 52, p. 204.

"Factors Affecting the Rate of Penetration of Rock Bits," by W. J. Bielstein and George E. Cannon, The Oil and Gas Journal, March 30, 1950, Vol. 48.

"Effects of Weight on Penetration," by H. B. Woods and E. H. Galle, The Oil and Gas Journal, November 25, 1957 pp. 88.

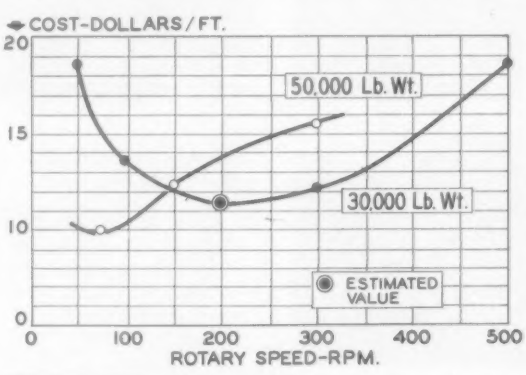
"How Rotary Speed Affects Penetration," by J. E. Eckel and D. S. Rowley, The Oil and Gas Journal, November 25, 1957, Vol. 55, No. 47, p. 86.

"Why Rock Bit Bearings Fail," by G. R. King, The Oil and Gas Journal, No. 16, 1959, Vol. 57, No. 47, p. 166.

"Analytical Determination of Optimum Bit Weight and Rotary Speed Combinations," by J. W. Graham and N. L. Muench, paper presented at the thirty-fourth annual fall meeting of the Society of Petroleum Engineers of AIME in Dallas, October 4-7, 1959.

"Effect of Mud Column Pressure on Drilling Rates," by A. S. Murray and R. A. Cunningham, AIME Petroleum Transactions, 204: 196: 1955.

"The Status of Turbodrilling in the U.S.A.," by W. E. Bingham, The Oil and Gas Journal, March 21, 1960, pp. 103.



DRILLING COST, dollars per foot, a function of rotary speed. Fig. 10.

What are the pumping loads?

BY JOSEPH ZABA

POLISHED-ROD LOAD is the sum, at the surface, of all the loads imposed on the sucker-rod string. It includes static, dynamic, frictional, and shock loads.

Static load is the weight of fluid lifted plus the weight of rods, less the buoyant effect. Friction loads consist of plunger, rod, and fluid friction. Shock loads are the result of mechanical action of pumping system. For example, if the pump barrel isn't filled on the upstroke, a shock load will be imposed on the system during each cycle when the plunger hits the fluid level in the barrel on the downstroke.

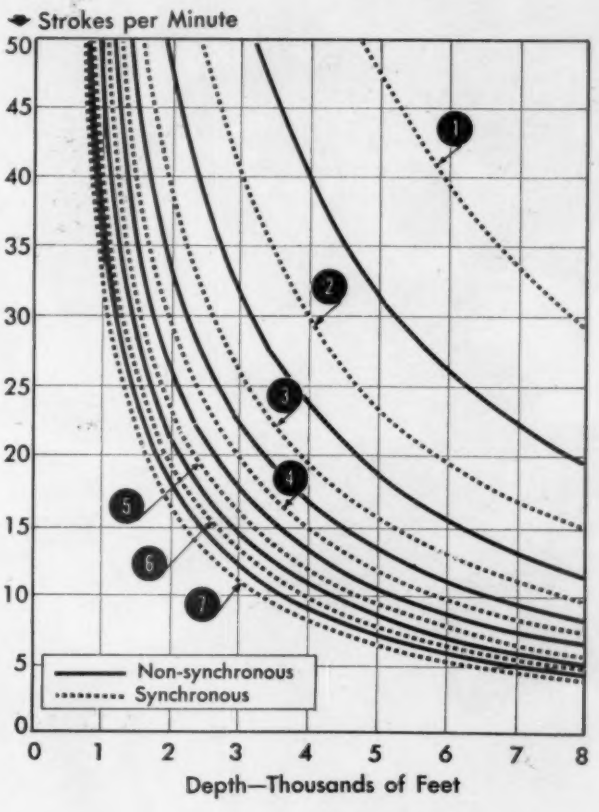
During the upstroke, loading consists of rod, fluid, and plunger friction, plus rod weight, less the buoyant effect, plus the differential load of fluid on the plunger. This differential load is the difference in weight of fluid in tubing, supported by the plunger, and the pressure exerted on the plunger by the fluid outside of the tubing. On the downstroke, the loading consists of rod weight, less the buoyant effect, and less rod, fluid, and plunger friction.

Based on theory and actual measurement of polished-rod stress, it is apparent that the loads outlined above are not enough to explain the resultant loading on the polished rod. The explanation can be found in the stress waves impressed on and reflected in the sucker rods because of mechanical vibration.

Vibration. Any material is subjected to mechanical vibration if disturbed by an outside force. If a force is applied to a rod, with one fixed end, a stress wave transmitting the force will travel through the rod in the form of a longitudinal wave. The velocity of the wave will be equal to the speed of sound in the material of the rod. At the other end of the rod the wave will be reflected and will return to the point of origin, etc. Thus, the natural vibration of the rod is instituted. Because of the effects of friction the intensity of vibration will diminish and finally disappear.

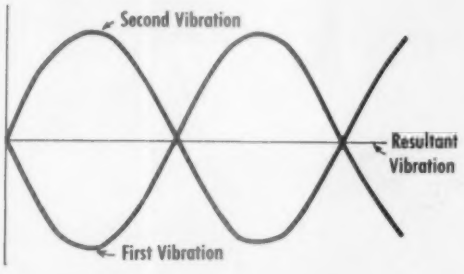
If another impulse is applied to the still vibrating rod, the first vibration may be increased or decreased. In the first case the vibrations are called synchronous, in the second case nonsynchronous. Depending on the phase angle and amplitude of vibrations there is an infinite number of combinations with which the two trains of vibrations may affect each other. Consider two extreme cases: (1) If a system is vibrating with certain frequency and amplitude and another vibration, of the same frequency and amplitude, is induced in phase with the first, the resulting vibration will have the amplitude twice that of the original; (2) if a second vibration of the same amplitude and frequency is induced 180° out of phase with the first, the two vibrations will cancel each other, Fig. 9.

Reports on studies of effect of vibration on the behavior of sucker-rod systems began to appear in the middle thirties.[1 2] With sucker-rod strings, two sets of vibrations have to be considered: (1) Vibratory motion imparted to the rod string by the surface pumping mechanism, and (2) the natural vibration of the rods. For minimum loads, nonsynchronous conditions are



PUMPING - SPEED CURVES. (From Drilling and Production Practice, API 1937, p. 182). Fig. 10.

TWO VIBRATIONS 180° out of phase cancel each other. Fig. 9.



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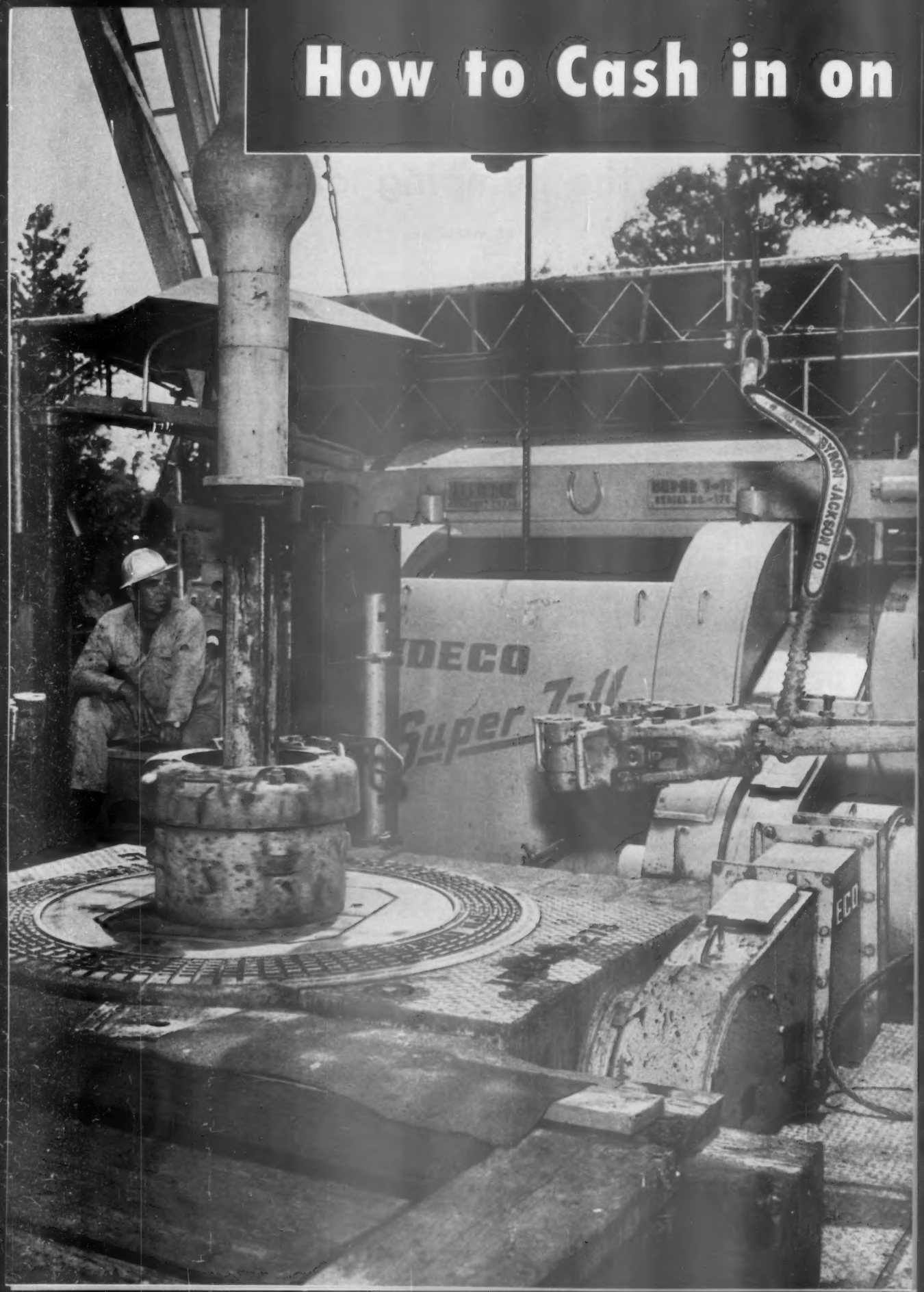

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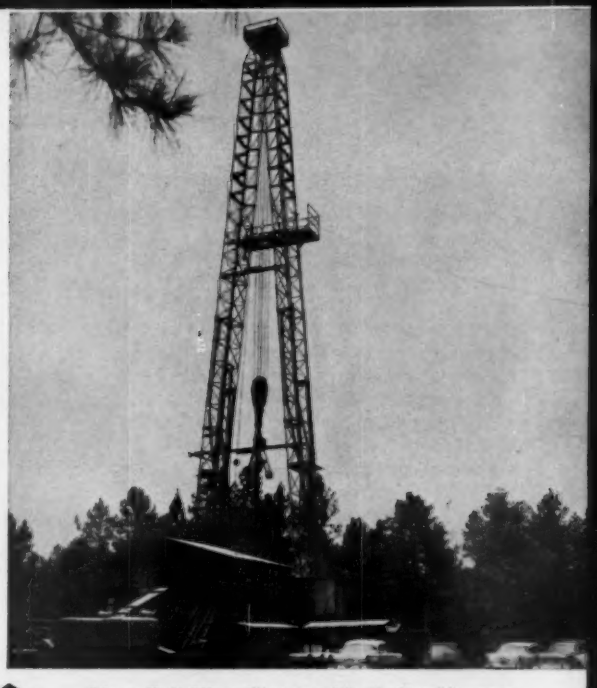

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best of these two sets of vibrations.

Using 15,800 ft. per second as the velocity of sound in steel, Slonneger derived a formula for the frequency of natural vibration of sucker rods:

$$F = \frac{237{,}000}{D}$$

where:

F = frequency, cycles per minute.

D = length of rods, ft.

For example, the frequency of natural vibration of a 4,000-ft. string of rods is 237,000/4,000 = 59.25 cycles per minute. If the frequency of the pumping motion were the same synchronous vibration would exist.

If the impulses are added to the vibrating rod at intervals which are equal to the natural frequency, the vibrations are called first-order vibrations. They are most severe since each wave is augmented by new energy. Second-order vibrations are those in which impulses are added at intervals equal to half the natural frequency. In the above example, speeds of 29.62, 19.75, etc. s.p.m. would be synchronous for a 4,000-ft. string of rods and the vibrations would be of second, third, etc. order. At other speeds the vibrations are nonsynchronous.

Slonneger prepared a series of curves from his formula, Fig. 10, which give the pumping speeds which are synchronous and nonsynchronous with natural frequencies for different lengths of rod strings.

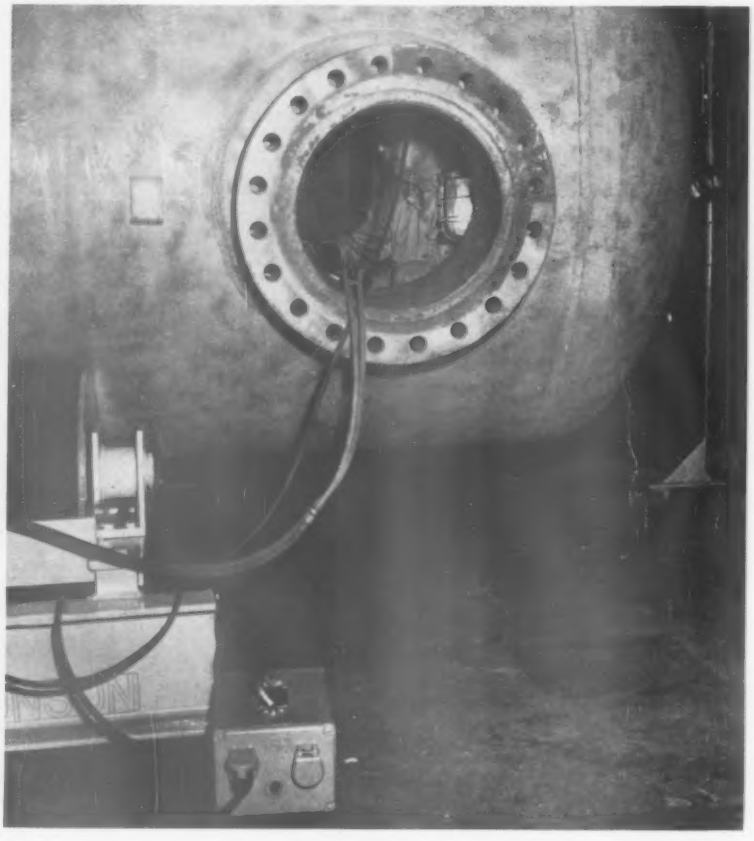
Cases are known in which repeated, unexplained rod breaks were eliminated by changing from pumping speed. There are many conditions under which the use of nonsynchronous speeds does not necessarily bring beneficial results because other factors, besides vibration, affect rod loading. Rod vibration affects plunger travel, and synchronous operation on the other hand may actually be beneficial, provided that it does not result in overload conditions.

The assumption that a sucker-rod string is a long spring with a suspended weight, actuated by a harmonic force under conditions of viscous damping, leads to errors. Actually, the weight and elasticity of rods are uniformly distributed through the whole string. And, there are two other elastic columns involved: the fluid and the tubing, unless the tubing is anchored. The differential equations of the behavior of such systems are complex. The magnitude of the impulses caused by the transfer of loads to and from the rods depends on the characteristics of the fluid pumped. For example, if a free gas is present in the pump barrel, the transfer of load from rods to tubing may be sufficiently gradual so that no vibration is initiated at the beginning of the downstroke. These and other factors brought about the analog studies of the subject, already mentioned.

Bibliography

1. Kendrick, John F., and Cornelius, Paul D., "The Sucker Rod Pump as a Problem in Elasticity": Trans. AIME 1937, P. 15.

2. Slonneger, J. C., "Vibration Problems in Oil Wells": API Drilling and Production Practice, 1937, P. 179.



Transformer unit designed for safety

A COMPACT, portable transformer unit is helping to promote greater safety and more trouble-free operation at the Baton Rouge refinery of Esso Standard, Division of Humble Oil & Refining Co.

The transformer provides a 32-volt output from a 120-volt input and is equipped with four receptacles. It is used where overhead lights are not available or practical and where 120 volts may present an electric-shock potential around grounded metal equipment.

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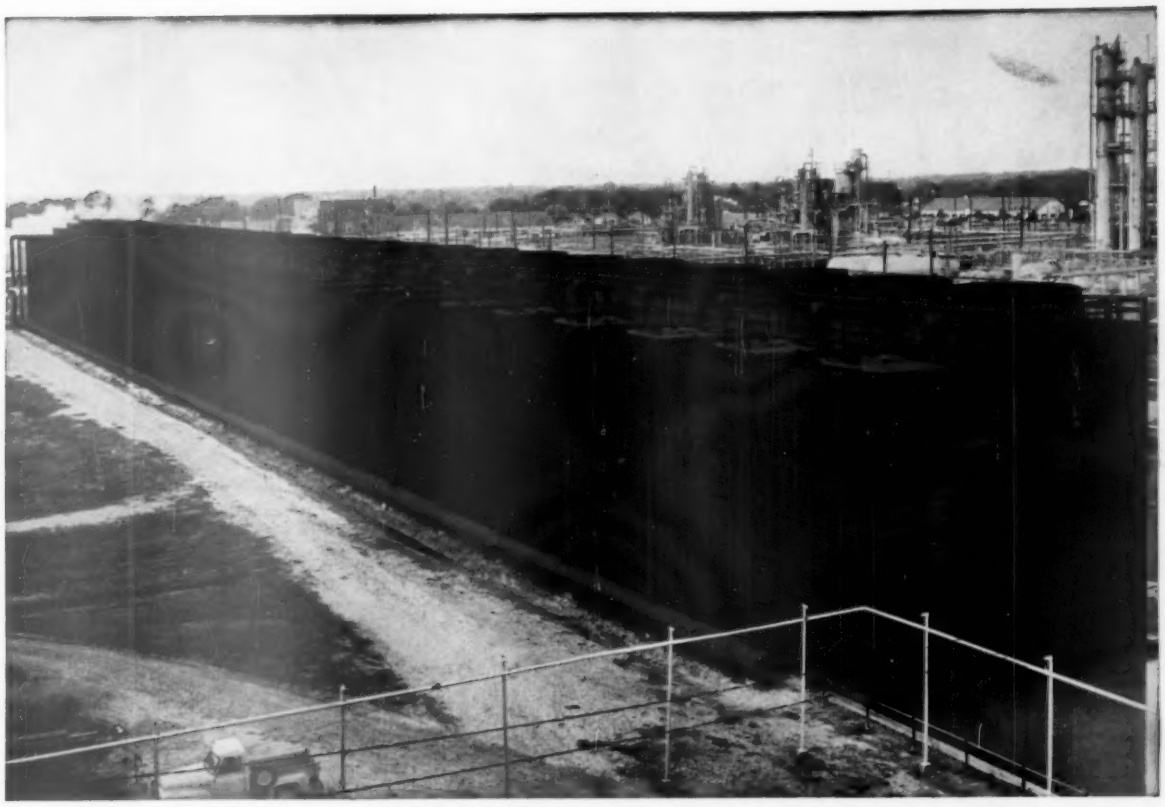
2. Terminals on the transformer are waterproof, with a rubber protective covering insulating the entire exposed socket area.

3. A lock on the transformer unit guarantees that the cord will not work free from the receptacle.

4. The light bulb is equipped with a waterproof glass shield inside the steel guard. It is not necessary to unscrew the guard to get to the shield. It has a hinged bottom section that can be easily opened without tools, and does not disturb the ground-wire connection to the guard.

Called the Joy Low-Voltage String-a-lite unit, it is manufactured and distributed by Joy Manufacturing Co.



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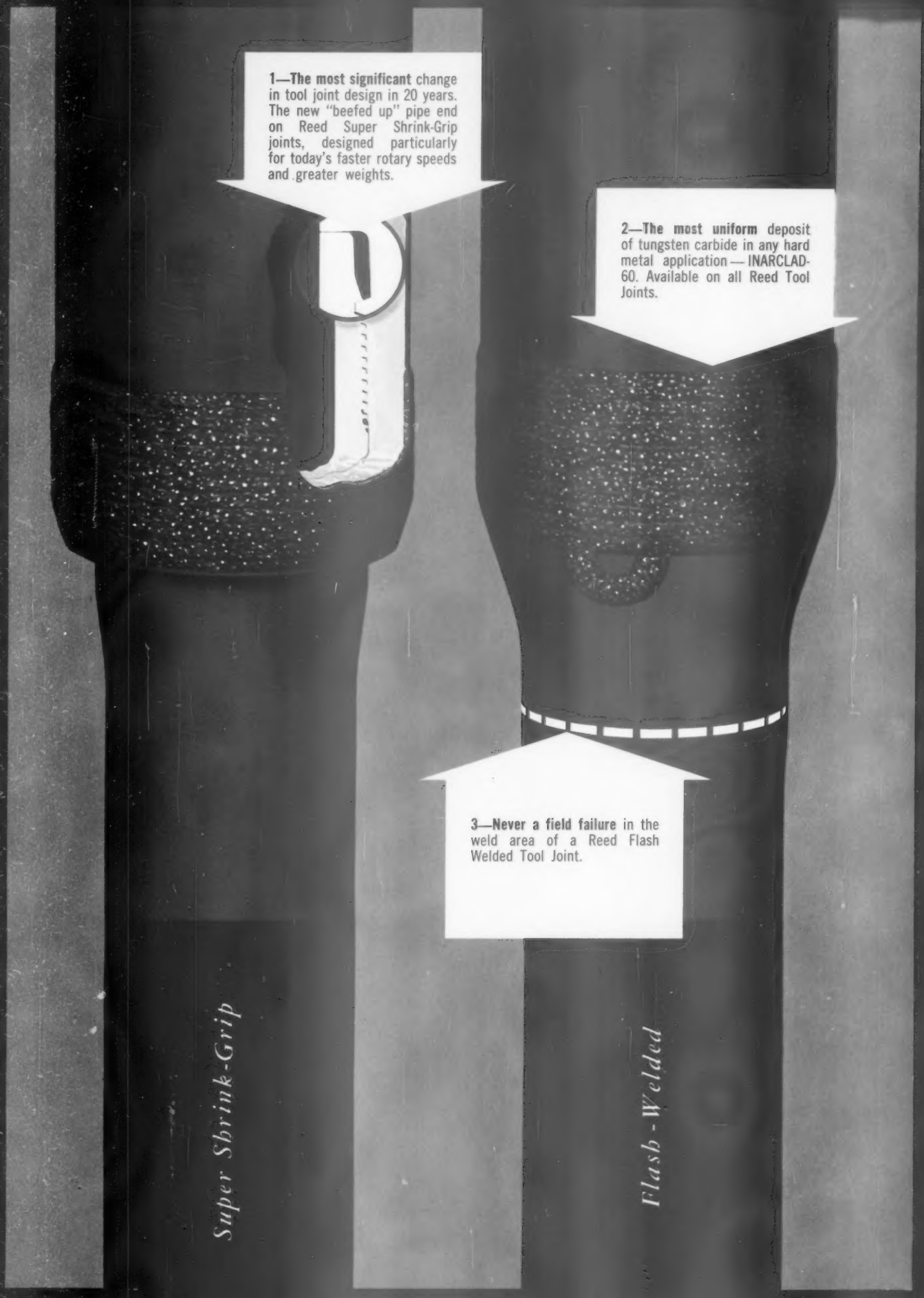
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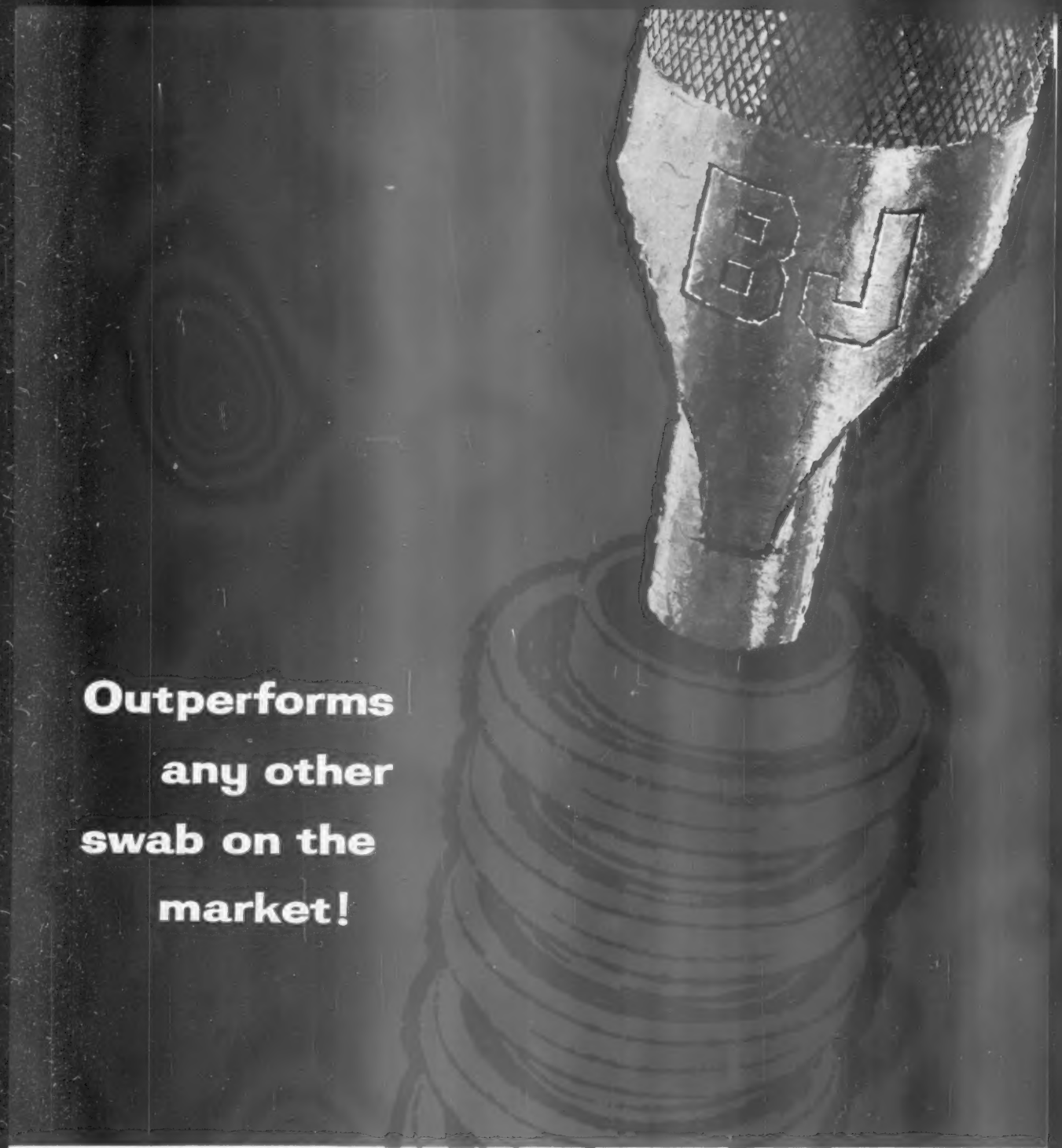

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BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Fuel needs of refineries since 1926

QUESTIONS have arisen concerning the refinery fuel cost shown in Process Costimating No. 4 (March 17, 1958, p. 190) and No. 5 (March 24, 1958, p. 211) because it seemed large. It represented the cost of refinery gases and catalytic coke burned as well as purchased fuel. Accordingly, the tabulation on this page breaks up the fuel cost so that the cost of purchased fuel can be more easily compared with refinery experience.

The total heat required and the refinery gas production were computed from the various types of process units used during each of the years since 1926, and the total amount of steam generated (see Process Costimating No. 13, May 19, 1958, p. 181). The total heat required is somewhat larger (for earlier years) than similar totals published by the U. S. Bureau of Mines (see Process Costimating No. 4, March 17, 1958, p. 190). Heat derived from the burning of coke from catalyst is not included in the total but its magnitude can be judged from the column shown in the tabulation. Also note that the heat from the coke is simply the heat absorbed or used in the cracking process (heat of decomposition and heating the catalyst). The heat generated from the coke is a much larger figure.

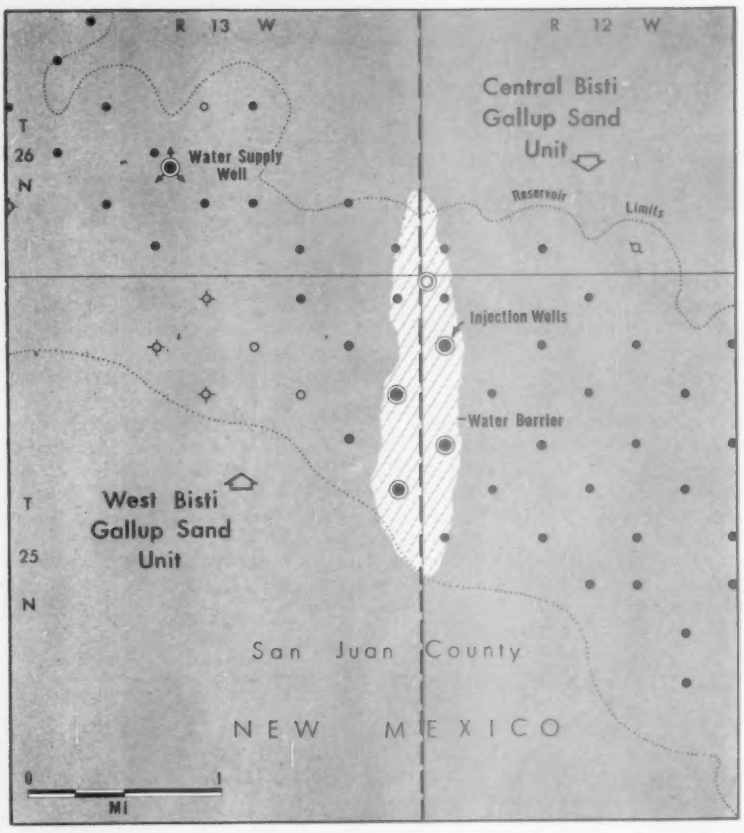
A small amount of steam is generated in some catalytic cracking plants, and this is shown as a separate column (it could have been handled by subtracting it from the total heat).

The values here are more dependable than those in Process Costimating No. 4 and No. 5.

Breakdown of refinery fuel requirements

	Refinery gases (dry)*		Steam generated from processes 10^3	Purchased fuel 10^3	Total† heat required 10^3	Recovered from cata. coke‡ 10^3	Ave.§ cost of fuel, cts./	Cents per barrel§				
	Ft.³/bbl.	Gross H.V. 10^3 B.t.u./bbl.	B.t.u./ bbl.	B.t.u./ bbl.	B.t.u./ bbl.	B.t.u./ bbl.	M.M. B.t.u.	Total value	Refinery gases	Cata. coke used‡	Steam from process‡	Purchased heat
1926	98	142	...	653	795	...	17	13.5	2.4	...	...	11.1
1927	102	148	...	642	790	...	¶15	¶11.8	¶2.2	...	...	¶9.6
1928	114	164	...	622	786	...	12.4	9.8	2.0	...	...	7.7
1929	131	189	...	590	779	...	¶12	¶9.4	¶2.3	...	...	¶7.1
1930	148	212	...	578	790	...	11.5	9.5	2.4	...	...	6.6
1931	158	226	...	589	815	...	8.7	7.1	2.0	...	...	5.1
1932	165	234	...	561	795	...	8.2	6.5	1.9	...	...	4.6
1933	171	242	...	563	805	...	9.1	7.3	2.2	...	...	5.1
1934	176	248	...	552	800	...	10.6	8.5	2.6	...	...	5.9
1935	181	255	...	571	826	...	9.9	8.2	2.5	...	...	5.6
1936	183	256	...	560	816	...	10.2	8.3	2.6	...	...	5.7
1937	184	258	...	537	795	...	10.7	8.5	2.8	...	...	5.8
1938	185	259	0.1	533	792	0.5	9.5	7.5	2.5	...	...	5.1
1939	182	257	...	508	765	1	9.4	7.2	2.4	...	...	4.8
1940	176	250	...	500	750	2	9.3	7.0	2.3	...	...	4.7
1941	173	248	0.5	468	717	3	10.1	7.3	2.5	...	...	4.7
1942	171	246	0.7	463	710	3	10.8	7.7	2.7	...	...	5.0
1943	182	264	0.9	410	675	4	11.7	7.9	3.1	...	...	4.8
1944	200	292	1.7	369	661	8	12.1	8.0	3.5	0.1	...	4.5
1945	209	307	3	367	677	14	11.9	8.1	3.7	0.2	...	4.4
1946	211	312	3	360	675	15	13.8	9.3	4.3	0.2	...	5.0
1947	212	316	4	353	673	16	19.1	12.4	6.0	0.3	0.1	6.7
1948	214	321	4	339	664	17	24.9	16.5	8.0	0.4	0.1	8.4
1949	217	324	4	297	625	19	18.4	11.5	6.0	0.3	0.1	5.5
1950	220	326	5	292	623	22	19.6	12.2	6.4	0.4	0.1	5.7
1951	225	329	5	290	624	23	22.1	13.8	7.3	0.5	0.1	6.4
1952	233	338	6	271	615	25	22.5	13.8	7.6	0.6	0.1	6.1
1953	255	367	8	260	635	30	24.2	15.3	8.9	0.8	0.2	6.3
1954	278	398	9	226	633	32	24.0	15.2	9.5	0.8	0.2	5.3
1955	302	422	11	205	638	35	25.8	16.4	10.9	0.9	0.3	5.3
1956	326	447	13	215	675	38	27.8	18.8	12.4	1.1	0.4	6.0
1957	345	462	15	234	711	42	31.2	22.2	14.5	1.3	0.5	7.3
1958¶	344	468	17	249	734	45	28.5	20.9	13.3	1.3	0.5	7.1
1959¶	342	472	18	269	759	47	27.8	21.1	13.1	1.3	0.5	7.5

*Recovered as fuel gas. †Total except the heat in the next column (coke). ‡Based on heat used (with no efficiency connection). §Value of (developed) heat from Process Costimating No. 4, The Oil and Gas Journal, March 17, 1958, p. 191. ¶Estimates.



Problems At West Bisti Engineers had some tough ones. Can we set a turbine-type water pump deeper than any other? Can we divide a reservoir along a surface property line? and . . .

Can we use two recovery mechanisms in same reservoir?

● West Bisti unit engineers have come up with the answers. Here's how they plan to water-flood their unit without interfering with an adjacent miscible flood in the same continuous reservoir. Pictures on opposite page show pump installation.

BY W. B. BLEAKLEY
Production Editor

MOST WATER FLOODS can be kicked off by drilling a water-supply well, a few injection wells, and working over some old producing wells.

But not so in the Four Corners area.

Engineers working on the proposed operation of the West Bisti Gallup Sand Unit, operated by British-American Oil Producing Co., ran into an unusual problem.

The problem. The engineering committee studied the reservoir characteristics of the Gallup sand to decide which recovery method would work best, gas injection, LPG injection, or water injection. There seemed to be objections to all of these; gas injection wouldn't be too efficient, miscible-phase operation would be too expensive because of the small local supply of LPG, and water flooding might cause too much oil to migrate out of the unit boundary.

Big trouble is that the unit boundary is just a property line on the surface. There is no other eastern limit to the reservoir, and the neighboring property is being operated by Sunray Mid-Continent Oil Co. as a miscible-phase flood. Some method had to be found to separate the reservoir into two parts. With this done, the West Bisti committee could proceed to water-flood their properties, and Sunray could continue operation of its miscible flood, without interference.

The solution. It was decided to create a water barrier between the two parts of the reservoir. Five wells were chosen for water injection: two on the west side of the line, two Sunray wells on the east side of the line, and one jointly owned well on the line. See map.

This is believed to be one of the rare cases where a single, continuous reservoir is being produced by two different recovery methods simultaneously, except in pilot operations.

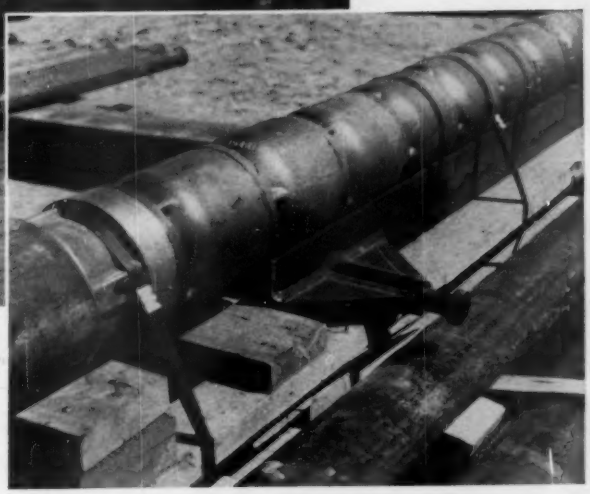
Water supply. A water-supply well was drilled to the lower Allison-Menefee sand at a depth of 2,540 ft. The well is located about 1½ miles northwest of the line of injection wells. It was cased with 9⅝-in. pipe, slotted opposite the water zone. A Fairbanks-Morse 59-stage turbine pump was set at 1,049 ft. The pump is driven by a gas engine. At the time of writing, this installation at 1,049 ft. was the deepest setting for a pump of this type. But other, deeper installations are in the planning stage.

Since August 1959, water production has been at a rate of more than 4,000 bbl. per day through 6⅝-in. pipe. A total of 800,000 bbl. of water has been injected to date.

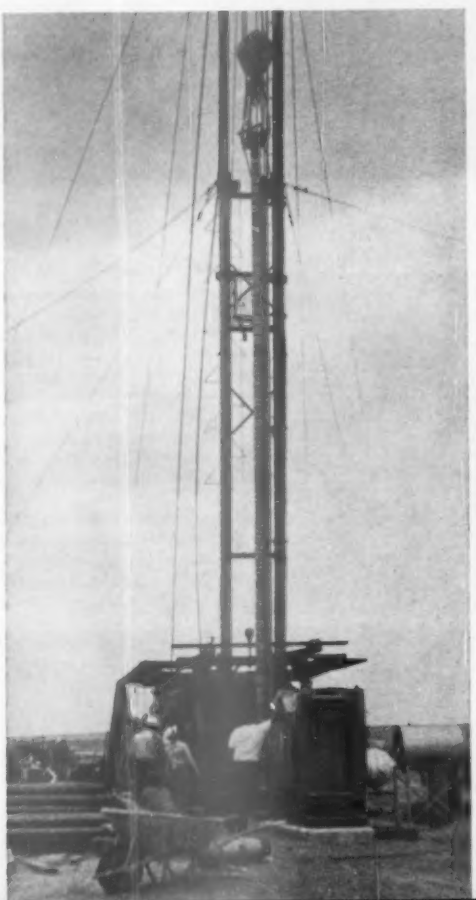
Full-scale flood. Flooding of the entire 5,142-acre unit is expected to begin in the near future. Full-scale operations will require a total of three water-supply wells. In addition to the 5 injection wells "on the line," 15 producing wells will be converted for water injection.

Estimates so far indicate that the injection rate for the entire reservoir will be 12,000 to 16,000 bbl. water per day. A total of 87.5 million barrels will be injected during the life of the flood.

How deepest water pump was installed at West Bisti



HERE THE BOWL ASSEMBLY, still attached to the shipping crate, is placed in position to be picked up by the derrick. Almost all of the 59 stages are visible in this photo. Inset shows an enlarged view of the discharge end of the bowl assembly (left) and some of the intermediate stages. The bowl assembly is of all-bronze construction.



WHAT THE WELL LOOKS LIKE from the surface, after installation is complete. Shown is the Fairbanks-Morse right-angle gear drive. A gas engine, not shown, is used to drive the unit. Gears in the right-angle-drive unit increase the speed at the pump in the ratio of 1:1½.

BOWL ASSEMBLY in position for lowering into well. Total length of unit is about 30 ft. No special rig equipment is needed to install the pump.

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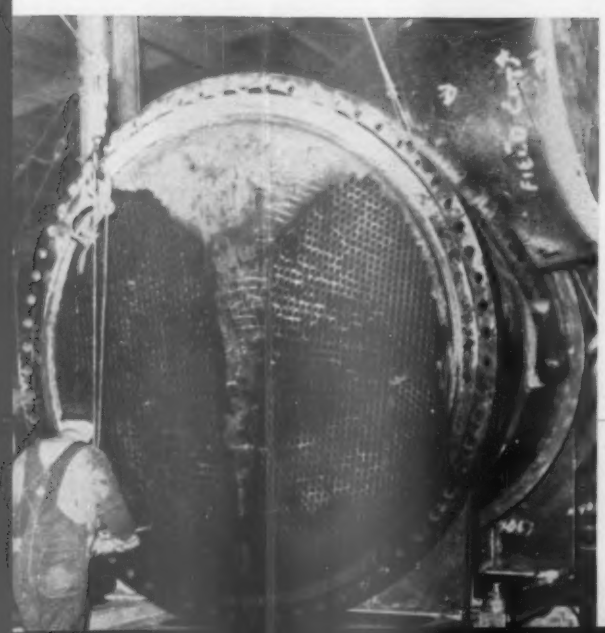
	Buttress	17.00			
7″	API	26.00	29.00	32.00	38.00
	Buttress	26.00	29.00		
7⅝″	API	29.70	33.70	39.00	
	Buttress	29.70	33.70	39.00	
9⅝″	API	43.50	47.00	53.50	
	Buttress	43.50	47.00	53.50	

IN ADDITION TO P-110, Republic produces 4½″ O.D. through 9⅝″ O.D. seamless casing in J-55 and N-80; and electric resistance weld from 2⅜″ O.D. through 13⅜″ O.D. in J-55 and H-40. For information, contact your nearest Republic representative or write: Republic Steel Corporation, Dept. OG-9784, 1441 Republic Building, Cleveland 1, Ohio.



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SCANNING AND LOGGING OPERATIONS and contract instrument maintenance have been successful, as shown by this report on . . .

Instrumentation, 3 years later

. . . at Tidewater's Delaware City plant

Information systems are valuable tools, constantly used by operators, and affording maximum use of data in real time in the control room.

BY S. E. ROTH
Instrumentation Coordinator
Tidewater Oil Co.

PLANNED PREVENTIVE-MAINTENANCE program pays off for Tidewater. Here, technician uses strobotach to check integrator-receiver motor speeds.

THREE YEARS of instrument operation at Tidewater Oil Co.'s Delaware refinery, south of Wilmington, has brought no cause for regret in having made decisions arrived at in 1955. The determination to take advantage of the potential benefits in scanning and logging has proven itself to be a wise move.

Eight control rooms serve as centers for 12 systems which collect some 4,000 points, logging the conditions hourly or more frequently on demand. Between logs, the points are scanned at rate of five per second. Conditions outside of a predetermined span are alarmed both visually and audibly with a record of the time, identity and value being made in a section of the typed log sheet reserved for the purpose.

Charge, yield, and utility data, as well as such historical values as are required, are totalized or averaged by the systems at the end of a process day and presented appropriately on each sheet. Individual paper tape punchers receive the totals simultaneously, coding the information for IBM use at the accounting department.

The "information systems," as we prefer to call them, are extremely valuable tools, constantly used by process operators. While maximum use of the data is made at the control-room level, a fund of information exists which will be used for extending the benefits by eventual control from the management operating level.

Tidewater continues to play host to a steady stream of welcome visitors, who are instrument minded and whose particular interest is in the information systems. We note, however, that there has been a change in the type of information sought. No longer are they concerned with payout or value. They recognize the approach, methods, application, and the philosophy we employed when asking Panellit to design the systems. The emphasis today is placed on performance and reliability.

Big experience factor. Delaware City is not only the refinery which uses data loggers, but no other can claim the volume of history built in 3 years of constant use since they were installed in the latter part of 1956. Our contribution to the art is based on experience with 12 systems which scan and log all process variables in a 150,000-bbl. per day refinery.

In the past year we have totaled approximately 100,000 hours of performance. The average on-time record shows 99.77%! The worst month was no lower than 99.5%.

Other companies have indicated a performance history comparable to ours. Unfortunately, however, there are suppliers who publish statements which tend to create the impression that this sort of equipment can be cranked up and walked away from. This state of proficiency we have not yet attained. We do use people; we do have a preventive-maintenance program; and we do anticipate trouble if we stop maintaining.

In addition, Tidewater must depend on process people giving maintenance technicians the utmost cooperation. Being the first to spot a suspicious readout or malfunction, operators immediately report the condition, thus keeping down time at a minimum. This particular phase is in itself a measure of the success we have had with educating operators, or rather, reeducating them.

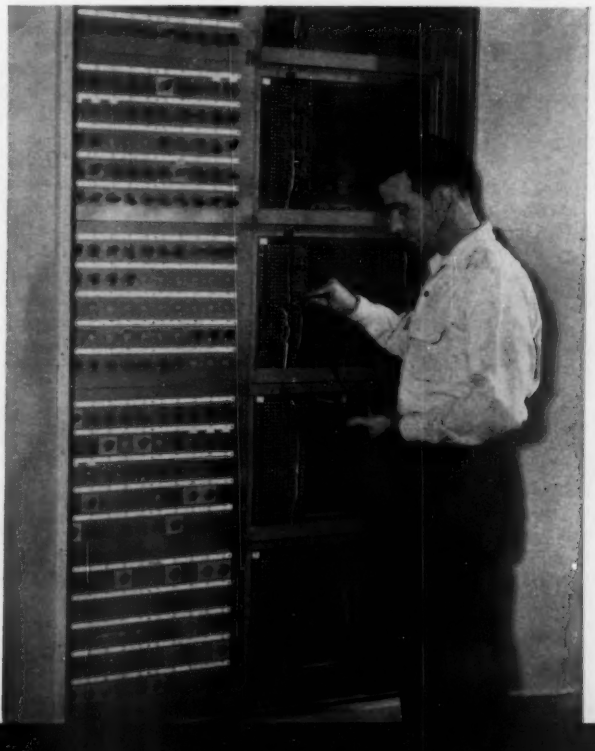
Performance improved. Initially we did not enjoy the success we now have. Logging after initial installation was only about 90% satisfactory. Scanning was no better than 75 or 80%. It is understandable that operators could not rely on hit-or-miss results. The attitude developed toward the systems was unhealthy.

Reasons for poor performance were not hard to determine. The systems were designed on the basis of good clean conditions, pressurized control rooms, and dust-free atmosphere. They arrived during refinery construction and we found it necessary to reseal concrete floors, put down rubber mats, control traffic, purge equipment cabinets, and in some areas change to sealed relays. These were obvious faults.

Some other reasons for poor results came from a lack of complete knowledge of requirements. Contractors had installed conduit and wire runs in a manner acceptable for po-

REGULAR LUBRICATION SCHEDULE is part of preventive-maintenance program. Stepping switches are included in the schedule.

MEMORY SYSTEM of 250-point scanner rack is checked regularly by an electronics technician.



tentiometric devices at a millivolt level but not good enough for electronic comparators. Noise and spurious signals resulted. Originally the circuitry called for a halt on a single bad point which would not balance. This was impractical and revised so that the open condition would be logged as such and permit continuity.

Typer troubles were no small part of the demand made on maintenance people. The supplier learned a lot in trying to keep eighteen 27-in. typers in operation. Those giving most trouble were of course replaced as fast as they could be rebuilt and revised.

Improvements in performance brought improvements in faith among operators. When we could back up our claim of reliability, we instituted a campaign for maximum utilization by operators. Trying to sell an item which had once been condemned is doubly difficult, but the facts could not be denied and continued satisfactory performance brought eventual acceptance.

Reliance has grown to the point where presently we find reluctance among operators to yield its use for even the short period during scheduled maintenance.

Systems maintenance. The Panellit Co. which designed the information systems also furnishes the maintenance. Four men on a 40-hour week covering 7 days contribute their time as follows:

40%—on scheduled preventive maintenance. This includes inspection, checking, cleaning, adjusting contacts, and lubrication.

15%—on calibration and checking of those points used by the accounting department for yield data. Manually transported punched tape is converted to punched cards and thus becomes the input data to an IBM 650. Periodic planimeter checks of analog records from process units are made against the integrator totalizers. Permissible deviation has been established at a 1% limit.

10%—on modifications which result from operational requests. These include rate changes, alarm-set-point changes, additions, deletions, revision in programing, etc.

15%—on revisions of equipment which will aid and ultimately reduce the need for demand and emergency service which takes up the remaining 20% of the time.

Included in revision time is changeover to new typers, pulse generators, memory alarms, sealed relays, and transistorizing where needed. Some of this time is allotted to the separable trend recorders of which there are two per system.

Although normal service is on an 8-hour basis, we have found it advantageous to conduct a first-aid course among those instrument technicians who are on a 24-hour shift servicing conventional process instrumentation. Records show that about once per week there is a report of first-aid administration which minimizes the down time. We exercise a 30-minute limit on first-aid jobs, believing that anything in excess of this requires expert attention. Such major troubles occur rarely.

Design improvements. Any discussion of performance of Tidewater's information systems cannot overlook the fact that the equipment is 5 years old in design. The rate of change is even more phenomenal than that of conventional instruments. Systems are available which have built into them the improvements we have found advisable to add.

A conservative estimate indicates that service time could be cut 20 to 25%, while maintaining present high level of performance by making indicated improvements. To decrease the time allotted presently to preventive maintenance involves a risk which would result not only in increased down time but destruction of reliability and faith among personnel. Rebuilding trust could take a long time. The ounce of prevention in information systems is well worth exercising.

Other instrumentation. Our visitors also ask about other instrumentation. Specifically, they are interested in any change of view since the decision to go pneumatic was made in 1955.

Most of our plot areas are within 400 by 450-ft. boundaries so that tubing runs stay less than 350 ft. long. Process-unit capacities are huge and work in our favor. The use of booster relays at 250 ft. with discretionary application of local mountings at 350 ft. has not been unsatisfactory.

In some instances where pneumatic crossover into other areas was required, we had no hesitancy in going electronic. These, too, have proven themselves.

The mass of instruments which generally accompanies a project as big as the Tidewater refinery tends to support theories which claim overemphasis. It is interesting to note, however, that many of the changes and revisions made since startup were toward additional equipment rather than elimination.

Yet we find that contrary to the expressions of concern raised by opponents of the full graphic panel, the additional instrumentation has been installed without destroying the rectilinear modules, without exceeding eye-level dimensions, and generally without contradicting the philosophy agreed to in design. There has been an increase in density. Some panel areas are over the 1.6 figure set in 1955, but there is no evidence of overcrowding or impression of jamming.

We do not mean to create the impression that every decision made was the correct one. We confess that there were a few silent offerings of thanks for having provided alternate or selective approaches toward the control of critical points. The value of standardized equipment (within categories) paid off handsomely by providing almost limitless flexibility.

Satisfaction among instrument people, however, is not a desirable trait. The fact that everything seems to be doing well is not enough evidence that it can't do better.

In the future. While standardization has its value, it should not hinder progress. The next process unit could be different in philosophy and approach. Decisions will not be made without a study of comparisons in performance and ultimate cost.

There is room for improvement in the philosophy of contractors regarding procurement of instrument material and the construction schedule. We have yet to see a job completed where there weren't newer and better instrument designs available.

The use of loggers and computors would definitely influence the decision since pneumatic signals need conversion.

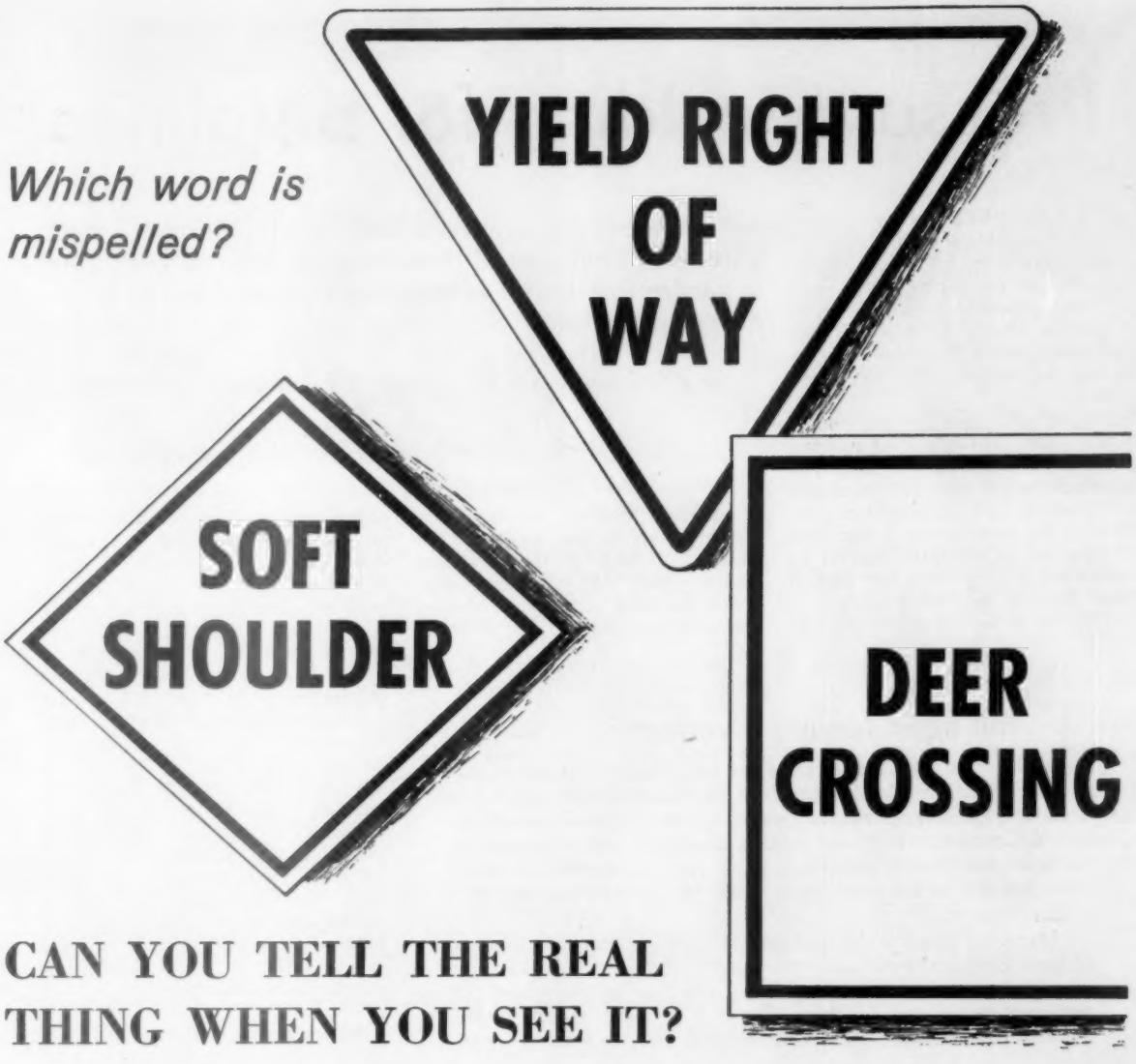
3 years ago we said:

"The refinery has the most complete operating and control information system ever installed either in an oil refinery or any process plant. Information obtained from 4,700 points is delivered to nine control rooms. Seven serve process units, one the utilities, and the other, the tank farm and blending units.

"Data from each system appear in four ways: on log sheets, on digital indicators, on trend recorders, and on punched paper tapes. The tapes from all systems will be assembled in a central data-processing facility, and in a matter of minutes, an accurate plant-wide report will summarize refinery operations for the past 24 hours. A complete inventory of all 88 tanks is automatically logged every 8 hours."

The Oil and Gas Journal, May 27, 1957, p. 167.

Which word is mispelled?



CAN YOU TELL THE REAL THING WHEN YOU SEE IT?

In spelling, or shipping . . . it's all too easy to miss out on important details.

Take liquid caustic . . . and the economic advantages of barge shipment. Our studies reveal that a great many caustic users who could profitably receive shipment by barge are not doing so. If you are situated near a navigable waterway, you may be one of them . . . and we may be able to help you find out. Call on us. We can ship caustic to you by barge or ocean tanker, truck or tank car . . . from Geismar, Louisiana, or from Wyandotte, Michigan. You write the ticket. We'd like to help you write it correctly.

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ANSWER: The word misspelled is "mispelled." Did you miss that missing S?

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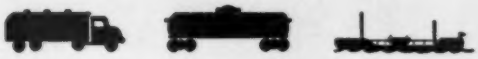


An evaluation of

Pressure welding for pipelines

● Tests prove this process is capable of consistently good girth welds, but several disadvantages seem to rule it out as a universally accepted economical means of joining large-diameter pipelines.

BY R. L. KOPPENHOFER, W. J. LEWIS, G. E. FAULKNER, P. J. RIEPPEL
H. C. COOK
Battelle Memorial Institute, and
Pipe Line Research Division, Esso Research & Engineering Co.

INDUCTION-PRESSURE welding is considered capable of producing welds which meet the strength and integrity requirements of underground pipelines. The process is limited, however, by the size of pipe to be joined. The limit in pipe size is based primarily on the size and weight of the equipment needed.

The basic need for field-welding pipe is suitable equipment for applying pressure and aligning the pipe. The equipment would have to be designed to: (1) join 40 to 80-ft. lengths of pipe, (2) align the joints so that a minimum of mismatch is obtained, and (3) be rigid enough to prevent any motion other than the upset being applied.

The ends of the pipe should be sized to minimize mismatch. An expanding mandrel could be used to expand the ends of all pipe to the maximum allowed under API specifications to obtain this sizing. Also, a saw, or other machining equipment could be attached to the aligning equipment to prepare clean square-butt joints that would abut with a minimum of joint separation. With equipment meeting these requirements, field welds could be made with the quality and consistency obtained in the laboratory.

The economic justification for employing the induction-pressure welding process for pipeline construction must be made by each operator or contractor who plans to use it. The costs of this equipment and its complexity must be balanced against the labor savings of a completely mechanized process and its possible time saving. From a rough evaluation it would seem that the process may offer a payout only where a great number of joints of the same size could be made at a very high production rate and at a high operational duty cycle.

"... still need for improvement"

In the construction of modern gas and petroleum pipelines the rate of progress overland is governed by the speed with which the separate pipe lengths can be joined together. Developments in ditching, pipe-handling, and coating equipment have speeded up the operation of the pipeline spread; pipe could be laid many times faster if an effective means could be found to join the pipe at this higher rate.

Improved internal clamps have solved the alignment problems of large pipe, and better electrodes and improved techniques have increased the stick-electrode welding speed to its maximum for optimum quality. It has been the goal of many groups in the pipeline industry to develop some method of making the 130 girth joints required per mile of pipe at a faster rate.

Manual techniques have been optimized, and the number of welders has been increased, but there is still need for improvement. The answer seems to be in mechanization. Double joining of pipe lengths prior to field welding has been used to speed up the pipeline spread. This has been some help but is still not the final answer. The process that is needed is one that is capable of joining pipe in a fixed position over-the-ditch at twice the rate of present methods.

An automatic method which in the past enjoyed moderate success in the field was the pressure welding process using oxy-acetylene gas burners to supply the heat. This process has also been used to weld many miles of railroad rail in this country and abroad. It involves heating the ends of the pipe to fusion temperature and applying an upsetting pressure to force the hot pieces together.

This type of weld is basically a "forge weld" similar to those made by the old blacksmith. The gas-fired pressure welding of pipe presented several disadvantages; in particular: (1) lack of adequate control of metal-forging temperature, (2) too long a heating time, and (3) too broad a heat pattern.

The authors

Research program. In a program aimed at developing mechanized field-welding operations for pipeline construction, Esso Research & Engineering Co. undertook a research program at Battelle Memorial Institute to investigate induction-pressure welding.

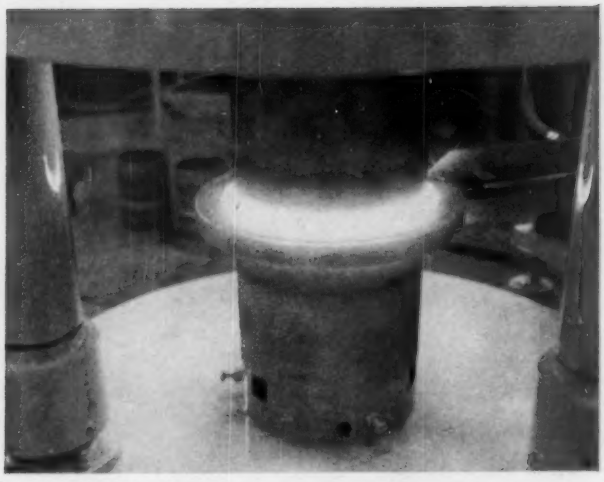
This process was studied because:

1. It can be used to weld pipe in the fixed position.
2. Welding rates are potentially high.
3. Gas and induction-pressure welding have proved satisfactory for making high-quality welds for other applications.

This report is the result of the laboratory feasibility study of the induction-pressure welding process. It presents the findings of a rather extensive study of the variables of the process and how they affect the final result.

All joints were made on 6⅝-in. o.d. standard-wall steel pipe using a press-type fixture which is capable of

HYDRAULIC PRESS for holding and upsetting pipe during welding. Fig. 1.



INDUCTION-COIL position is shown with respect to the pipes being welded. Fig. 2.

more rigid alignment and more positive upsetting pressure than can usually be obtained in a field clamp. The results prove that it is possible to consistently weld an entire girth seam in standard steel pipe which is capable of withstanding present specification tests in about 1 minute's time.

However, the process has several physical disadvantages which it is felt eliminate it from universal acceptance as an economical means of joining present-day large-diameter pipelines. These are: (1) high cost and the complexity of the equipment, (2) the stringent clamp-alignment requirements (especially for large-diameter pipe), (3) the need for special pipe preparation and/or argon shielding, and (4) the unreliability of nondestructive tests for the finished joints.

The bases for each of these objections are as follows:

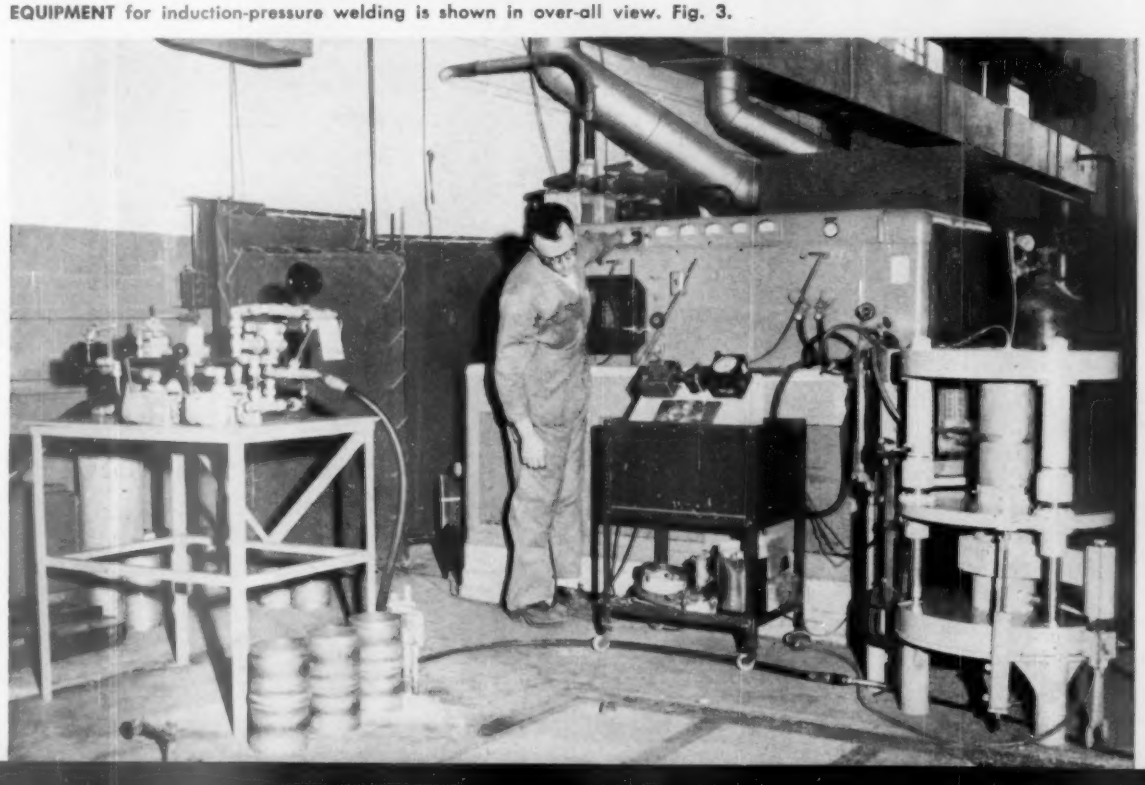
1. Equipment. The equipment needed for this process is expensive, complex, and cumbersome for over-the-ditch operation. A 200-kw. induction generator is required for 12 to 16-in. pipe sizes. It is estimated this would cost $35,000. Additional power-supply accessories such as transformer and induction coil would be $15,000.

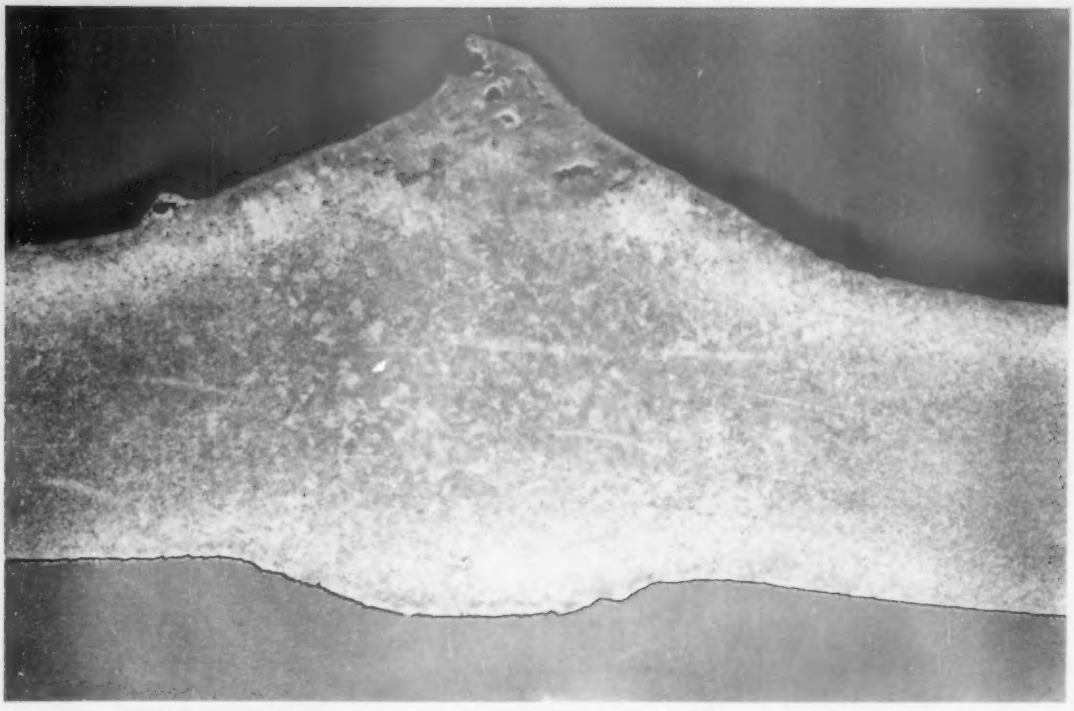
Pipe positioning, holding, and upset-pressure equipment capable of holding and aligning 40-ft. pipe joints to very close tolerances during the weld would cost about $50,000. The total estimated cost of $100,000 would therefore ordinarily limit the process to plant or yard double-jointing operations where a large number of joints of a single size are made at a very high production rate.

Heavy electrical cables, high-pressure piping, and the complex hydraulic system necessary would in addition make the equipment awkward for pipeline spread use.

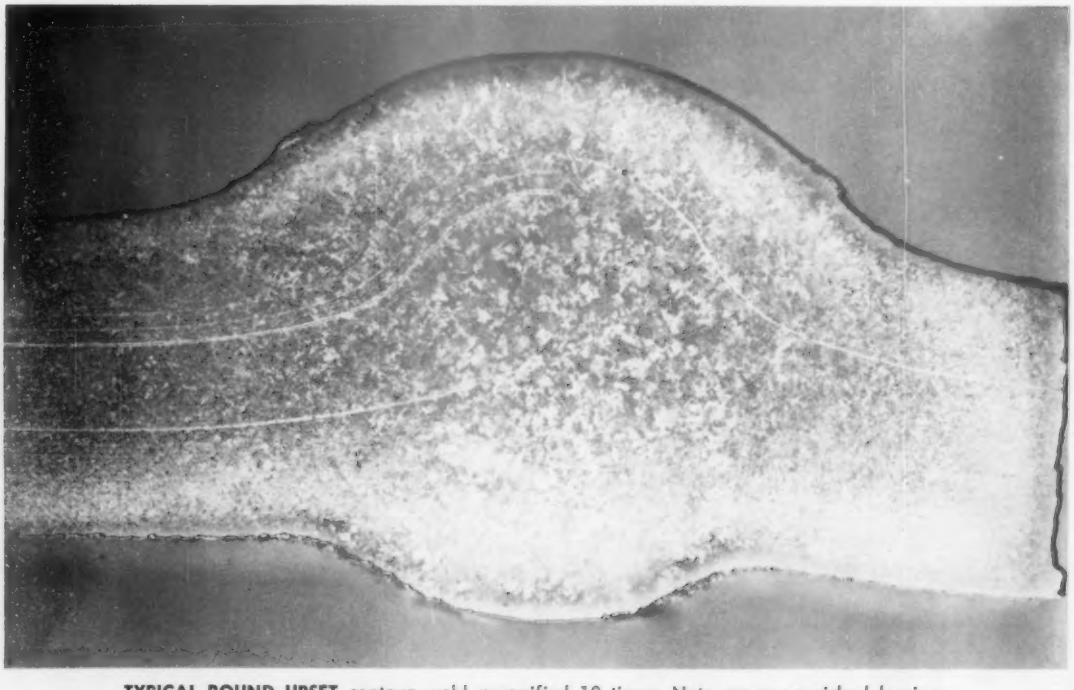
2. Alignment. Proper alignment during upset is essential to this process. Pipe ends must match each other and be concentric with the induction coil to avoid uneven heating and improper welds. The necessary dimension tolerances would be difficult to obtain and

EQUIPMENT for induction-pressure welding is shown in over-all view. Fig. 3.

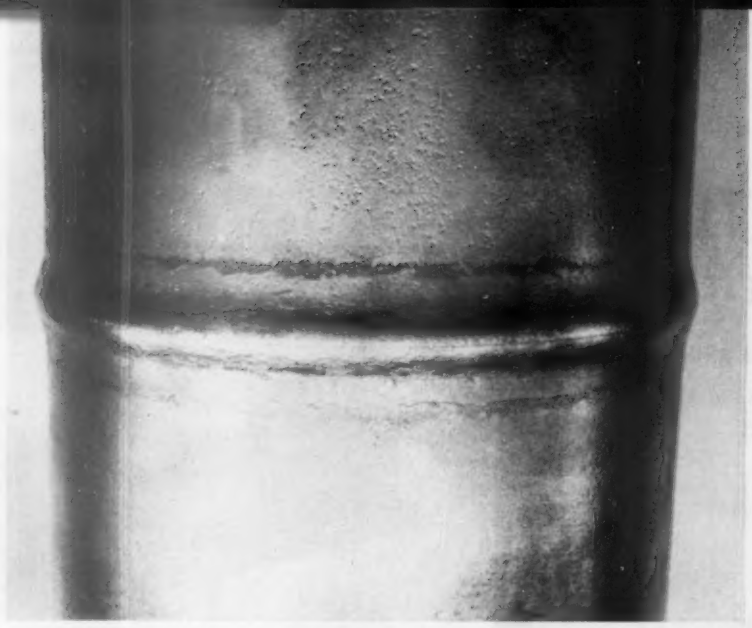




TYPICAL SHARP UPSET contour weld magnified 10 times. (Weld was etched in Hall's etchant—20 g. $KMnO_4$, 20 g. NaOH, 20 g. Na_2CO_3, 8 g. $K_2Cr_2O_7$, 200 cc. H_2O.) Fig. 4.



TYPICAL ROUND UPSET contour weld magnified 10 times. Note oxygen-enriched laminations in pipe material. (Weld etched in Hall's etchant.) Fig. 5.



TYPICAL ROUND UPSET contour induction-pressure weld. Fig .6.

maintain in field operations and we feel would be impossible in thin-wall pipe more than 16-in. diameter under the presently specified dimensional tolerances for pipe. A presizing operation on each pipe end may correct this, but would add to the machine's cost.

3. Pipe preparation. Pipe ends should be dry, clean, and rust-free for the process to produce consistent, high-quality joints. Argon shielding is required for optimum results. This also adds to the complications and cost of the process.

If the pipe ends were dry machined in place immediately prior to welding, the argon could be eliminated. Any method for cleaning or machining the pipe faces prior to welding will complicate the equipment and increase the cost of the operation.

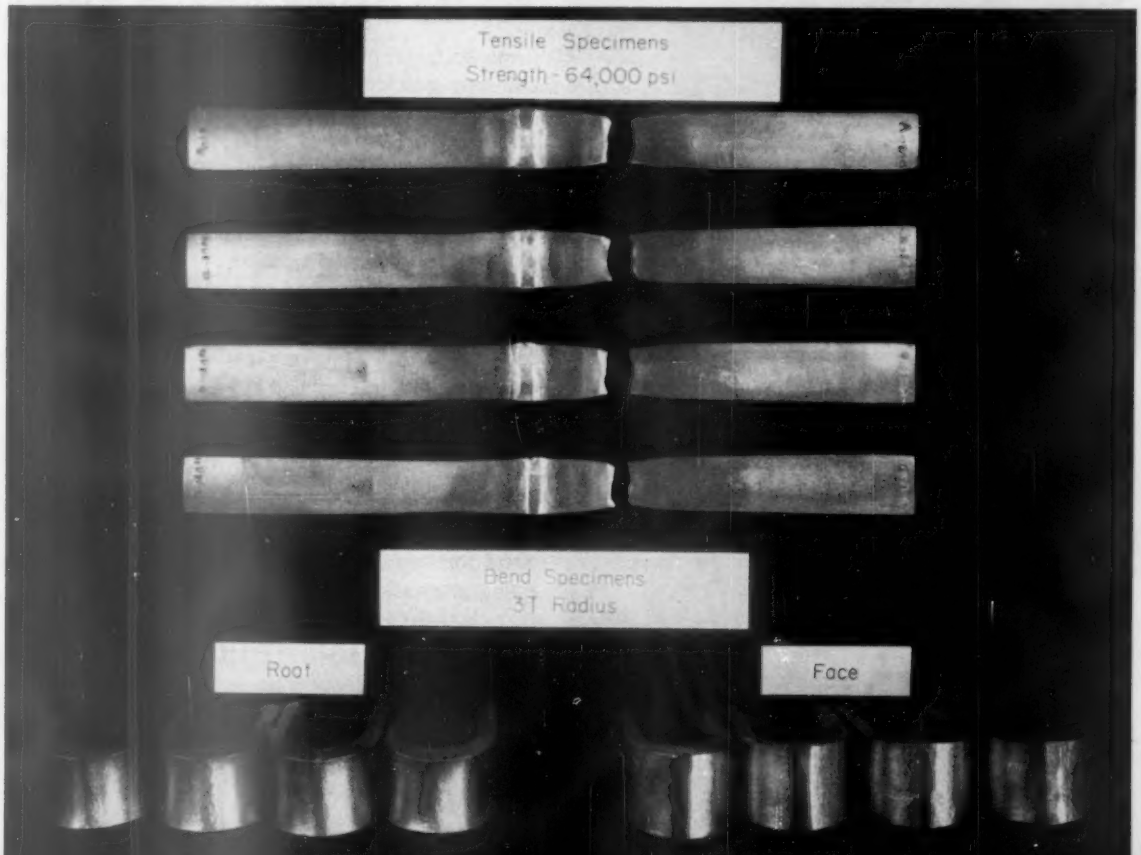
4. Quality control. After the induction-pressure weld has been made there is at present no reliable nondestructive test that can be used to insure the quality of the joint. All known test methods including X-ray, ultrasonic reflections, magnaflux, etc. are either insensitive or unreliable for consistently detecting flaws in this type of weld.

Induction-Pressure Process

Induction-pressure welds are made by the application of heat and pressure to the ends of the pipe being welded. In making these welds, the ends of the pipe are butted together under pressure and heated by induction. Heating is restricted to a small width on either side of the abutting surfaces by the use of a suitable induction coil that is concentric with the pipe. Heating occurs when high-frequency alternating current is supplied to the coil.

The flow of current sets up a magnetic field within the coil which, in turn, induces an electric current in the

TYPICAL RESULTS of bend and tensile tests on round upset welds made according to API specifications. Fig. 7.



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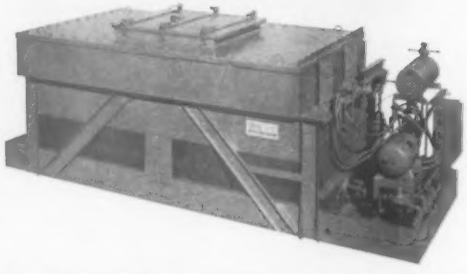

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TABLE 1—WELDS MADE UNDER RECOMMENDED WELDING CONDITIONS*

Weld No.	Total heating cycle, seconds	Upset pressure, psi.	Coil-to-pipe distance, in.	Number of guided bend tests made, Root	Number of guided bend tests made, Face	Number of joint failures, Root	Number of joint failures, Face
47	51.5	2,500	7/16	4	4	1	0
48	48.9	2,550	7/16	4	4	0	0
49	50.6	2,550	7/16	4	4	0	0
50	63.0	2,550	7/16	4	4	0	0
51	61.0	2,550	7/16	4	4	0	0
52	51.4	2,550	7/16	4	4	0	0
53	52.0	2,550	7/16	4	4	0	0
54	49.0	2,550	7/16	4	4	0	0
55	49.8	2,550	7/16	4	4	0	0
57	52.6	2,500	7/16	4	4	0	0
145	64.1	2,450	1/2	4	4	0	0
146	57.4	2,650	1/2	4	4	0	0
147	54.9	2,650	1/2	4	4	0	0
148	57.7	2,450	1/2	4	4	0	0
150	56.2	2,450	1/2	4	4	0	0
151	65.2	2,450	1/2	4	4	0	0
152	63.4	2,450	1/2	4	4	0	0
157	57.3	2,450	1/2	4	4	0	0
158	58.6	2,450	1/2	4	4	0	0
205	49.4	2,900	7/16	4	4	0	0
206	48.0	2,750	7/16	4	4	0	0
207	49.6	2,600	7/16	4	4	0	0
208	56.3	2,450	7/16	4	4	0	0
209	55.3	2,600	7/16	4	4	0	0
212	56.9	2,750	7/16	2	2	0	†1
213	56.5	2,750	7/16	2	2	0	0
218	55.8	2,450	7/16	1	1	0	0
219	54.2	2,450	7†16	1	1	0	0
220	59.2	2,600	7/16	1	1	0	0
221	55.7	2,600	7/16	1	1	0	0
222	54.9	2,600	7/16	1	1	0	0
223	54.2	2,750	7/16	1	1	0	0
224	53.3	2,750	7/16	1	1	0	0
225	55.2	2,750	7/16	1	1	0	0
226	56.0	2,900	7/16	1	1	0	0
227	54.9	2,900	7/16	1	1	0	0

*Upset distance = 1/8 in.; inside of pipe purged with argon at 50 cu. ft./hour before and during welding.

†Fracture occurred at the edge of the specimen at the weld interface.

pipe. This induced current heats the pipe. As the pipe ends are heated to temperatures above about 2,300° F., the pressure exerted on the pipe deforms or upsets the abutting ends. By achieving intimate contact at high temperatures, gain growth, diffusion, and coalescence occur across the interface, resulting in strong welds.

The test program. Induction-pressure welds were made in 6⅝-in. o.d. 0.280-in.-wall Grade B steel pipe. The welds were made in a hydraulic press (Fig. 1) that was designed to hold the pipes rigidly and to apply the pressure for welding. A single-turn, water-cooled induction coil ⅞ in. high was used to supply heat and was mounted on the press with its midplane at the interface between the pipes being welded (Fig. 2).

High-frequency current for heating was supplied by an 80-kw. 9,600 c.p.s. motor-generator-type induction unit. The welding and heating cycles were controlled and timed automatically so that welding conditions could be reproduced easily. Fig. 3 shows an overall view of the equipment.

The effects of the following variables were studied during the development of satisfactory induction-pressure welding conditions:

1. Upset pressure—the pressure exerted on the pipe during welding.

2. Upset distance—the distance traveled in upsetting the pipes during heating.

3. Heating cycle—the time during which heat was supplied to the joint.

In addition to these, the effects of argon shielding and joint alignment on weld quality were evaluated.

The use of various welding conditions produced welds with two types of upset contours. A sharp upset contour (Fig. 4) was obtained with low upset pressures (1,500 to 2,300 psi.) and a relatively high rate of heat input. A round upset contour (Fig. 5) was obtained with high upset pressures (2,300 to 4,000 psi.) and a relatively low rate of heat input. A considerable number of voids were obtained in sharp upset contoured welds which were caused by laminations in the pipe wall.

These laminations ruptured during welding because of the high temperatures and the heat pattern required to obtain this type of weld. However, round upset welds were not impaired by these laminations. In addition, the bend and tensile properties of round upset welds were better than those of sharp upset welds. Fig. 6 shows a typical round upset contour induction-pressure weld. Fig. 7 shows some typical tension and bend specimens made according to API specifications.

Welding conditions. A fairly wide range of welding conditions can be used to obtain round upset contour welds that easily pass API specifications for field-welded pipe. Welding conditions determined for making satisfactory induction-pressure welds are as follows:

1. Upset pressure—2,450 to 2,900 psi.
2. Upset distance traveled during the heating cycle—⅛ in.
3. Heating cycle—50 to 65 seconds.
4. Shielding—argon purged inside pipe at 50 cu. ft./hour.
5. Joint design—square-butt closed joint—free from dirt, oxide, and grease.

Welding studies showed that the use of argon shielding on the inside of the pipe during welding resulted in better weld consistency than could be obtained without shielding. In addition, joint alignment had considerable effect on weld quality. As would be expected, best weld quality was obtained with optimum joint alignment. However, welds made with joint gaps up to 0.030 in. and pipe out-of-roundness of 1/32 in. passed API specifications for field-welded pipe.

An indication of the consistency of induction-pressure welds made in pipe can be seen in Table 1. Thirty-six welds were made in 6⅝-in.-o.d. pipe with welding conditions that fell in the recommended range listed previously. Of the 36 welds, 34 joints met the API bend requirements and 2 joints had 1 bend failure. One failure (weld No. 212) was at the edge of the bend specimen and the validity of the test is questionable because an adjacent specimen did not fail. The other fracture (weld No. 47) occurred in the first weld made using these welding conditions. An adjacent specimen in this weld also did not fail.

Acknowledgments

The authors express appreciation to Esso Research & Engineering Co. and to Battelle Memorial Institute for permission to publish this paper. The authors also express appreciation for assistance offered by M. J. Dabney and M. F. Sheely, of Esso Research & Engineering Co.

Acknowledgment is also due S. J. Dearring and R. E. Pollock for the preparation and testing of the weld-joint specimens and to R. D. Buchheit for metallographic work.

LIQUID ETHYLENE at a frigid —155° F. is carried in this insulated stainless-steel tank truck from Imperial Oil Ltd. in Sarnia, Canada, to Montreal.

Stainless-steel tank trucks proving worth

. . . as haulers of oil products and petrochemicals—hot or cold

TANK TRUCKS moving today over our highways carry a variety of products ranging from liquid ethylene at —155° F. to molten anhydride at 366° F. Besides transporting ethylene, ammonia, butadiene, styrene, LPG, and gasoline for the petroleum and petrochemical industries, the same for-hire truckers carry fuming nitric acid and other chemicals.

As more and more diverse products are shipped via truck tankers, fleet operators become increasingly insistent in their search for the tank that can carry all, or nearly all, of these liquids.

Between hauls, of course, the tank interior must undergo chemical cleansing which makes ease of cleaning one requisite for the ideal tank material. Need for regular recleaning with powerful stripping compounds makes obvious several other requirements: low maintenance costs and long service life. Ability to resist the corrosive action of most, if not all, liquid or molten petrochemicals is a requirement so basic that it only need be noted that many modern-day metals and plastics fall short of the need.

So far, the construction material most closely approaching all these specifications is stainless steel, says R. E. Paret, committee of Stainless Steel Producers, New York. In fact, use of stainless-steel tank trailers is on the rapid upswing. Statistics available for the petroleum industry indicate that within the past year and a half, annual purchase of stainless equipment has jumped at least one-third over 1957 figures.

Though originally costing as much as twice that of carbon steel, ($6,750 for a 4,300-gal. unlined tank), and perhaps 10% more than aluminum, current users indicate that stainless tanks cost less to maintain, last longer, and can carry more products than any other commonly available materials of construction.

Ease of cleaning. Cargo residues are reported by petroleum and petrochemical transporters to be easier to remove, and to aid the cleaning job, strong alkali cleaners can be used on the stainless tanks without damage to the tank itself. Tank linings, needed to handle many corrosive fluids in carbon-steel tanks, are often not necessary when stainless is the material of construction, eliminating the cleaning care and special precautions demanded by sensitive and expensive linings.

In the rapidly expanding area of cryogenics, stainless steel takes a natural place because of its low-temperature toughness. A very few other materials of construction also possess ductility at subzero temperature, but even these fall short where vibration and impact are anticipated in service.

Added advantages. Other reasons for stainless steel's growing popularity include several changes in ICC rulings made in late 1956. First, and perhaps most important, permission was given to petroleum truckers to haul both petroleum and chemicals. After this, a truck could go out with petroleum products and return with a load of chemicals, but the truckers, of course, needed tankers that could handle chemicals.

A second important ICC development permitted building stainless-steel tanks in the same gage as tanks of low-alloy, high-strength steels. Previously, one gage heavier was called for and stainless suffered from a weight disadvantage which showed in a smaller payload than possible with high-strength low-alloy tanks.

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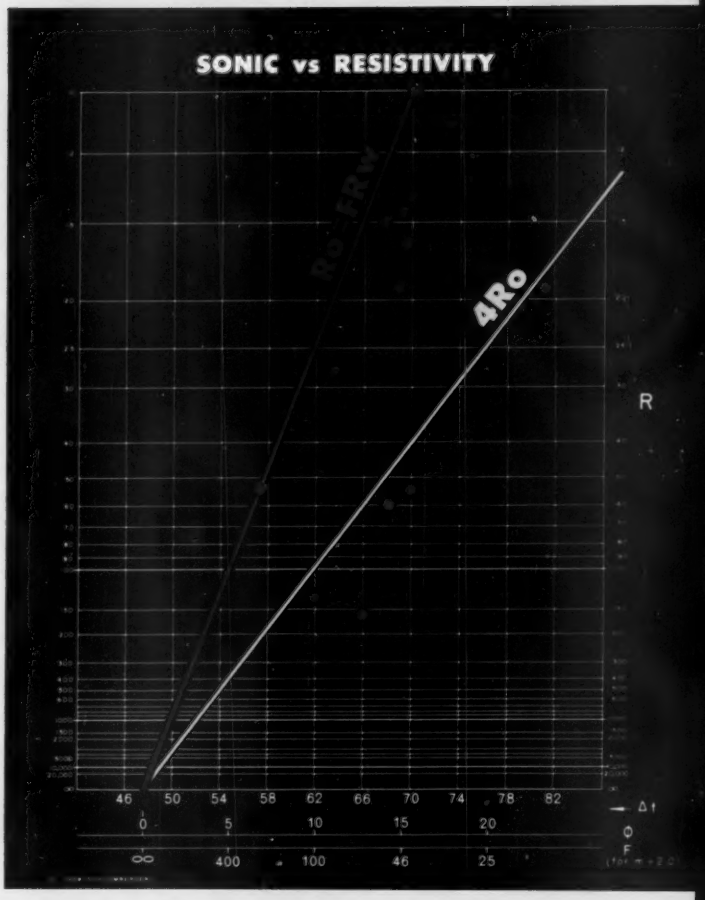

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Even flooding caused by a tropical storm couldn't stop this twin rig operated by Falcon-Seaboard Drilling Company, Sun-Bashara Lease, Saratoga, Texas. Wells No. 1 and 4 (above) are pumping from a Yegua formation at 7,000 ft. The X-2 strings, 2,500 ft of $\frac{7}{8}$ in. and 4,500 ft of $\frac{3}{4}$ in., bring up 38 bpd of 35.8-gravity oil with no water. There has been no rod failure since April, 1952.

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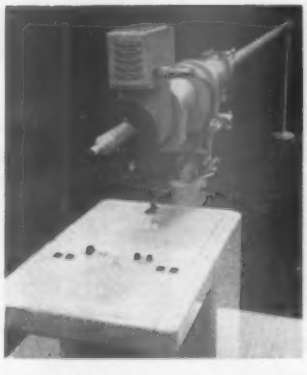
Two roof slopes are offered in the self-framing and rigid-frame buildings: 2 to 12 or 4 to 12 pitch. Source: **Armco Drainage & Metal Products, Inc., Middletown, Ohio.**

Fast highway boring

. . . is promised by an improved road-boring machine now available for boring under highways, railroads, and other pipeline crossings. Available in two models, 30 and 42-in., the machine has lifting eyes designed to let the operator select the eye that gives the best balance for a particular job.

Adjustable chains with chain clamps are used as pullhooks. The winch controls permit six forward-speed variations. All working parts are easy to get to for inspection and maintenance. Source: **Crutcher-Rolfs-Cummings, Inc., 7825 Katy Road, Houston.**



Optical inspection

. . . device has been developed to inspect the grain bore for solid-rocket motors that can be used in a portable version to probe pipes and tanks or any type of irregular enclosure presenting hard-to-get-at interiors. Present versions of the device can conduct a probe of 30 ft. with one insertion, the maker reports. Called the Aerojet optical grain checker, it features a safe external light source, a mirror which is driven along a slotted optical tube, and a telescope. The device can inspect an opening down to 2 in. in diameter with no practical limit on maximum diameter. It can be fitted with a camera for detailed photographs of possible cracks, or stress points. Source: **Aerojet-General Corp., Azusa, Calif.**

●

Building panels

. . . in many colors factory-applied are available now for both preengineered and custom metal-building construction. The color system, called Butler-Tone, for the aluminum and galvanized building panels is a baked-on synthetic resin type of finish. After the color is applied on the unformed material, the material is then shaped, punched, and sheared to form either insulated or noninsulated exterior panels.

Also available from the manufacturer is an aluminum roof with a 20-year roof guarantee, reportedly the first in the preengineered metal-building industry. Source: **Butler Mfg. Co., 7400 E. 13th St., Kansas City 26, Mo.**

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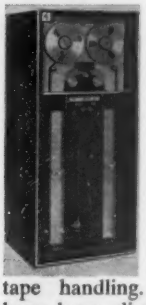

. . . promised by a new digital tape instrument, the M3000, designed to materially accelerate both the handling and storage of data on magnetic tape. A linear action electropneumatic reeling and tape-drive system is used to provide gentle, yet positive tape handling. Reciprocating parts have been eliminated to prevent impact and avoid wear on both the machine and the tape. Source: **Midwestern Instruments, Box 7186, Tulsa.**

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Differential pressure

. . . indicated in filter and fuel systems with two new indicators, Models 300-6 and 300-3. They are designed to meet the specialized requirements of flow measurement. Light in weight, they come with either a 6 or 3-in. dial and are equipped with a seamless bellows. Source: **Industrial Instrument Corp., Drawer 777, Austin.**

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Ladder

. . . is self leveling as it is equipped with an automatic self-leveling device, called Ladr-Levl. The device for the wooden Surefoot ladder consists of a coil spring within an aluminum alloy tube. The spring automatically adjusts the ladder's legs to uneven terrain. Once the ladder is set and the legs have compensated for uneven ground, the bottom rung automatically sets a pin lock when the user takes the first step. Source: **Industrial Ladder Co., 1212 Powell, Oakland, Calif.**

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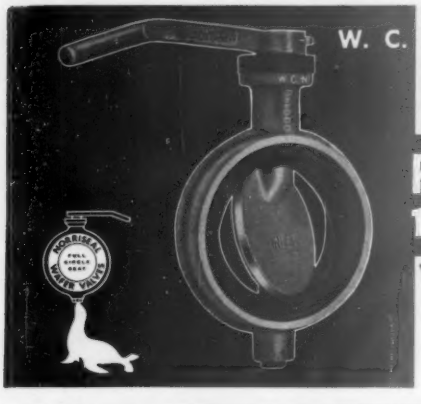
Hydrocarbon detector

. . . for oil exploration and processing is available to detect and analyze hydrocarbon gases in concentrations as low as parts per billion. Called FIAD for flame ionization analyzer and detector, the instrument may be used for continuous analysis of the total hydrocarbon content of a gas stream, the maker claims, or to de-



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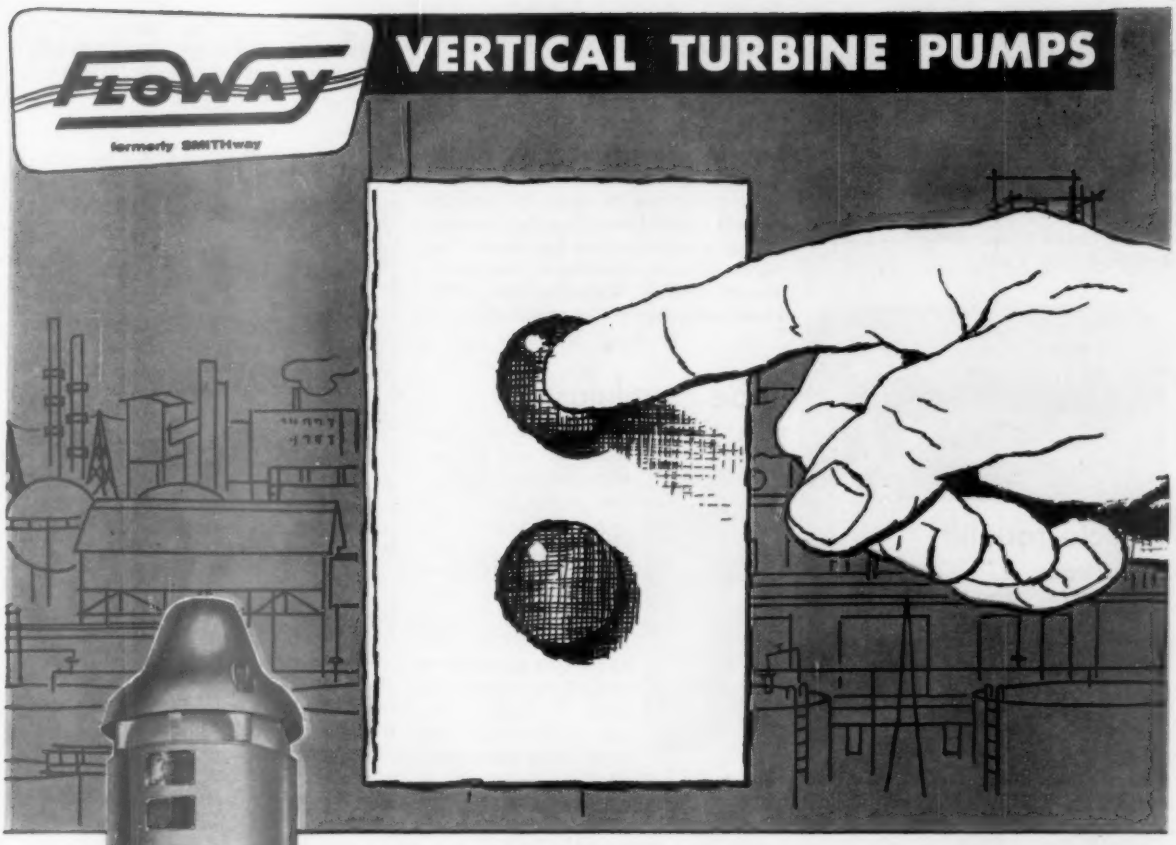

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... attachment is available with a 1,000 lifting capacity. The Model 1000 Tiger fork lift attachment is complete with the maker's Model D1612-FA battery-powered winch and H-42 automatic electric brake. It is easily and quickly installed and removed. No modifications or drilling of holes in the vehicle are required. Source: **Tiger Mfg. Co., 2312 West Pacific Coast Highway, Long Beach 10, Calif.**

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... Epoxy-Kote 695, offers protection for metal pipe against abrasion and corrosion from water and soil acids. The coating can be easily brushed on on cold days by warming the can containing the coating in hot water. On warm days, no heating is necessary. Source: **Carl H. Biggs Co., Inc., 1547 Fourteenth, Santa Monica, Calif.**

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Swing joint

...comes in many styles and is designed for petroleum and petrochemical service. Made in eight sizes from 1 to 8 in., the joint can be obtained threaded, flanged, beveled for welding, or bored for welding. The dual raceways are flame-hardened. The packing gland is spring-loaded for constant pressure on the gland at high or low pressure. Source: **Wheaton Brass Works, Springfield Rd., Union, N. J.**

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The special demonstrator pictured shows the flexibility of the "U"-Seal. The pipe position changes, but the seal remains tight. A special fungus and bacteria retardent is added to the compound for extra protection. Seals available in sizes 2" and larger.

VERSATILITY OF INSTALLATION

The fully reversible "U"-Seal is easy to install in the new "U" shape or in WmSon's familiar "Z" shape. A screwdriver is the only tool needed to tighten the two stainless steel bands. Send for technical bulletin.

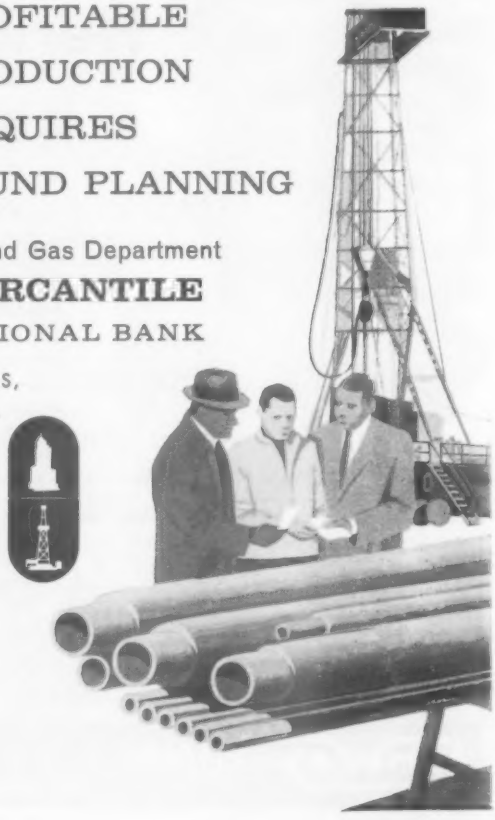
YOU CAN SEAL WITH A "U"-SEAL
Write Dept. A2 for Bulletin A-281

T.D. Williamson, Inc.
P. O. BOX 40 TULSA 2, OKLAHOMA

REPRESENTATIVES AROUND THE WORLD

PROFITABLE
PRODUCTION
REQUIRES
SOUND PLANNING

Oil and Gas Department
MERCANTILE
NATIONAL BANK
DALLAS,
TEXAS



Anywhere in the World
that
LOST CIRCULATION
is a serious problem

You can be more sure of getting returns and saving money when using Masterseal Products.

MASTERSEAL*
MASTERBRIDGE*
MASTERPLUG**

Unexcelled bridging ability combined with pump trouble free operation, make them the most efficient and practical available. First choice by operators and drilling contractors from Canada to the Gulf Coast.

*U. S. Pat. 2,799,647
Canada Pat. 594,599

**U. S. & Can. Pats. Pending

SPECIALIZING IN LOST CIRCULATION SINCE 1954

MASTERSEAL COMPANY
P.O. BOX 1501
VENTURA, CALIF.

DISTRIBUTORS
Louisiana:
General-Mud Specialties, Inc.,
New Iberia, La.
Rocky Mountain and Canada:
Wyo-Ben Products Co.,
Billings, Montana

SHOWCASE . . .

New Equipment

the desired depth, permitting proper placement over a wide range of well conditions, according to the developer.

The additive reportedly has shown excellent results in the Gulf Coast area. It has been used in wells as deep as 14,000 ft. for setting pipe and for shutting off undesired zones. Source: **Dowell Division of The Dow Chemical Co., Box 536, Tulsa.**

•

Pipe-leak clamp

. . . and a new strip type of gridded gasket with metal backing offer a way for maintenance departments to reduce repair clamp inventory as one clamp width and a gasket strip can be used to make repairs of any length in multiples of 3 in., the maker reports. The Redi-Clamp has a lug base designed to minimize crush pressure. The Sta-Grid gasket is made of ⅛-in. gridded neoprene vulcanized to a 26-gage stainless-steel backing. Source: **Smith-Blair, Inc., 535 Railroad Ave., S. San Francisco.**

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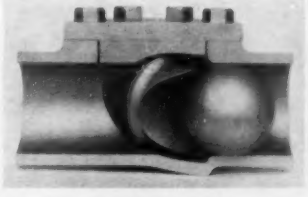
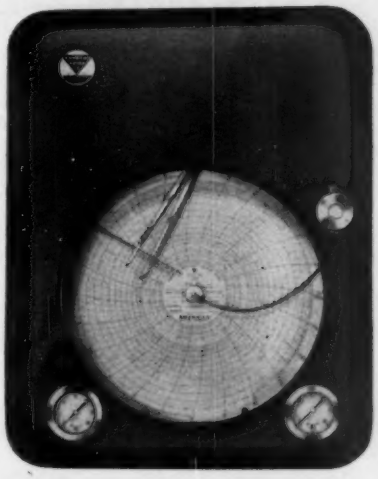


Check valve

. . . lets scrapers pass and promises to prove valuable on lines where ball-marking of interface or batch change is used. The clapper is side-hinged. A ball, upon entering the valve, contacts the conduit-shaped clapper. The clapper floats on thrust bearings and is controlled by a one-piece hinge pin. Hinged on an 8-degree angle, it swings to the side and recesses completely into the body of the valve.

Called the Sphere-Clear valve, it comes in 1 to 36-in. sizes in steel, semisteel, or aluminum bronze for all API and ASA fittings. Source: **Frank Wheatley Pump & Valve Mfr., Box 1948, Tulsa.**

AMERICAN®



SERIES A-88 CONTROLLERS

Designed to give rugged, dependable performance, Series A-88 Controllers provide versatile, positive control of . . . Flow, Pressure, Liquid Level and other continuous process variables . . . accurately and automatically.

- Rugged, null-type non-bleed Relay.
- Simple, in-the-field linkage adjustment.
- Maximum Proportional Band changes with minimum output pressure changes.
- Proportional Band easily widened without disconnecting instrument tubing.
- Spring-closing Reset Valve sealed with bellows and calibrated according to time.

Ask for Bulletin CT-49.

AMERICAN® METER COMPANY
INCORPORATED 1887 ESTABLISHED 1874
General Offices: Philadelphia 16, Pa.
Sales Offices in Principal Cities

SHOWCASE . . .

New Literature

Automotive exhaust

. . . purifiers for oxidizing carbon monoxide, fumes, and odors from gasoline, LP-gas, and diesel-powered equipment, are illustrated and described in a four-page folder just published. The literature gives technical characteristics and typical elimination data for three types of catalytic purifiers. It points out bad effects of carbon monoxide and exhaust fumes and describes how exhaust purifiers reduce carbon monoxide, hydrocarbons, and aldehydes by catalytically combining them with oxygen. Source: **Oxy-Catalyst, Inc., Devon, Pa.**

Rotary-pump

. . . selection manual takes rotary-pump technical data, simplifies it, and presents it in an easy-to-understand way. Liquids are grouped into eight classifications according to viscosity, each classification having its own selection table. The table with typical liquids of a given viscosity is listed on one page, while on facing pages are listed many other liquids of the same viscosity. This makes it possible to make a fast, accurate rotary-pump selection by matching the liquid to the pump. Source: **Deming Co., Salem, Ohio.**

Seamless welding

. . . fittings booklet just announced, contains photographs and a general description of fittings, new seamless manufacturing operations, dimensional and metallurgical control processes, and testing procedures. All types of maker's standard fittings are shown with their size ranges; included are examples of special fittings and their applications. Source: **Midwest Piping Co., Inc., 1450 S. 2nd St., St. Louis 4.**

Pump

. . . squeezes water upward as a result of its new positive-displacement pumping action, according to a newly revised bulletin just issued. Bulletin B-142 illustrates features of the Hi-Lift pump, and also contains numerous points on evaluating water needs. Source: **Peerless Pump, Hydrodynamics Div., Food Machinery & Chemical Corp., 301 W. Ave. 26, Los Angeles.**

Specialized tools

. . . and services available to the oil industry are detailed in a new 1960 McCullough catalog. It gives a comprehensive explanation of sizes, application, and operation of all company tools and services. Source: **McCullough Tool Co., 5820 S. Alameda St., Los Angeles.**

Derrick lighting

. . . systems and components publication, available now, is designed to serve as a ready reference to assist you in selection problems. The eight-page literature gives complete, detailed information as to the exact type of light or component needed. It covers systems and components for all derricks and masts. Source: **Hutchison Mfg. Co., P.O. Box 9335, Houston 11.**

Double-cushioned check valves

. . . which prevent damaging hammer and shock due to back surge, are outlined in Bulletin WS-1A. It recommends installation on boiler feed lines, steam pumps, compressors, and reciprocating pumps. Source: **Golden Anderson Valve Specialty Co., 1265 Ridge Ave., Pittsburgh 33.**

Acidizing services

. . . for the oil industry are detailed in a new eight-page booklet just published. It tells where acidizing is most effective and deals with special problems. Included is information on inhibitors, different types of acids, and various application techniques. Source: **Dowell Division of The Dow Chemical Co., P.O. Box 536, Tulsa 1.**

Reversible gas-expanding turbine

. . . Type GET, for gas-pipeline-valve applications, reclaims horsepower from gas-expanding operations, reports new Bulletin 2000. The turbine is designed for 1 to 45 hp. with 1,000-psig. maximum inlet pressure. Source: **Dean Hill Corp., 4000 E. 16th St., Indianapolis 7.**

Motor-application

. . . guide outlines motor characteristics and includes up-to-date information on motor designs. Sixteen-page Bulletin 270B deals with motors ranging from 1/20 to 400 hp., polyphase, single phase, and direct current. Source: **Century Electric Co., 1806 Pine St., St. Louis 3.**

LEARN LATEST

VIKING SALES PERSONNEL ATTEND FACTORY SALES AND ENGINEERING SEMINARS.

You can buy a **VIKING** Pump with confidence because the man selling it really knows how to apply the best pump to your particular pumping problem. Yes, your **VIKING** sales technician is well-trained and experienced, and a student of new pumping applications. He attends factory sales and engineering seminars, like the one shown above, to review facts and secure new data on standard and special pumps. He keeps up to date on the latest models and improvements.

Yes, you can place your confidence in the **VIKING** salesman and the **VIKING PUMP**—engineered for your pumping problems. For information, send today for catalog 60 **ST. VIKING PUMP COMPANY**, Cedar Falls, Iowa, U.S.A. In Canada, It's **"ROTO-KING" PUMPS.**

Offices and Distributors In Principal Cities • See Your Classified Telephone Directory

NEAR PERRIN, TEXAS

D6B MOVES EARTH FASTER—preferred by oil company

Owner Willie M. Mitchell keeps his D6B busy the year around. In addition to oil field jobs, he handles soil conservation work. A long-time user of Cat equipment, he says the new D6 is tops whatever the task.

"It's the best!" That's how owner Willie M. Mitchell described his new Cat D6B Tractor at a site preparation job 5 miles east of Perrin, Texas. "I'm moving dirt faster and easier than with my previous D6 and maintenance time is cut in half—the oil company I do work for wants Cat equipment on the job. They know they are getting more work for the hours they pay for."

Working in clay and packed drilling mud in wet weather, Mr. Mitchell dozes about 100 yards an hour in 150-foot passes. In a 10-hour day, he dozes or moves about 1000 yards. He finds the D6B with an 8-foot blade ideal for this kind of work. The short straight blade combines productive capacity with narrow width. No highway permits are required to move the machine from job to job.

Willie M. Mitchell has been operating tractors for the past 15 years and he knows what he is talking about when he states that the D6 "maneuvers well, has plenty of power, and visibility is good."

Your Caterpillar Dealer can prove to you right on your job how the new D6 steps up production. Call him today.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

THE NEW D6 SERIES B

New Engine — The Caterpillar D333 Diesel Engine delivers 93 HP at the flywheel for an increase of 25 per cent in lugging ability. It features a new direct acting governor which means fast engine response to load changes.

New Integral Hydraulic System — Under-hood mounting of tank, pump and valves permits easy routing of hydraulic lines to bulldozer or implement cylinders, frees front and rear for other equipment.

New Operator Convenience — All new cockpit has co-ordinated controls that make operation nearly effortless.

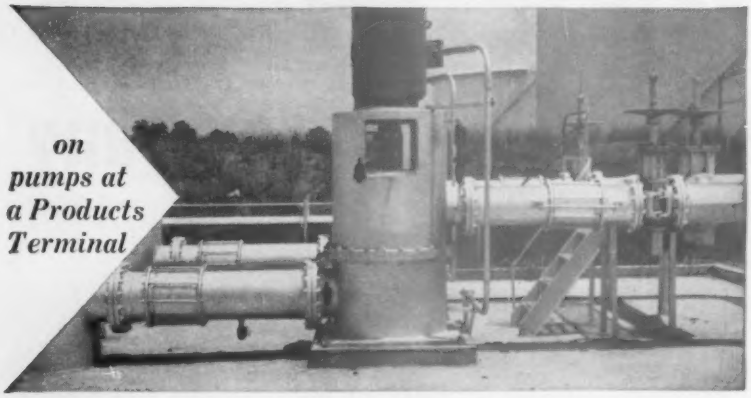
PLUS Timesaving Maintenance Features — The exclusive oil clutch gives up to 2000 hours of adjustment-free service. Lifetime lubricated track rollers with exclusive floating ring seals never need servicing during life of roller. Dry-type air cleaner removes 99.8% of the dirt even in the dustiest conditions, is serviced in just 5 minutes. Hydraulic track adjusters (optional).

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

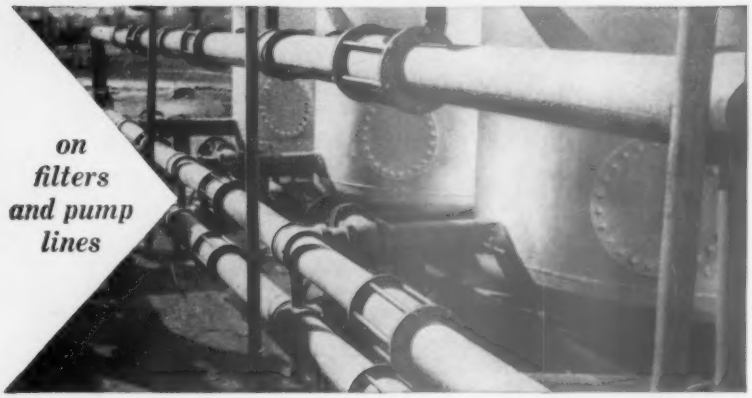
THE NEW D6— PERFORMANCE PROVED ON THE HARD JOBS

Dresser® Couplings—



on pumps at a Products Terminal

easy, bottle-tight...



on filters and pump lines

safe, permanent joints!

Dresser Couplings are easily installed and bottle-tight for life! The specially compounded Dresser Gasket provides rugged "give and take" to absorb vibration, settlement and other stresses that might cause damage. And there's no pipe threading. With plain end pipe, any workman can install Dresser Couplings in an average two man-minutes per bolt *using only a wrench.* And even with pipe deflection up to 4°, you still get a perfect Dresser-Coupled joint. Send for Dresser Catalog No. 531; it contains more detailed information and complete specifications on *all* Dresser Couplings, Fittings and Pipe Repair Products.

• GET THEM FROM YOUR LOCAL OIL FIELD SUPPLY STORE

Bradford Pennsylvania

Chicago
Houston
New York
S. San Francisco
Toronto & Calgary

DRESSER MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES

INTER-URBIA

Growth Market for the Gas Age

Concentrated in the New York-Newark Interurban complex are more natural gas consumers than in any single *state* of the union. Not satisfied to remain America's Number One Market for consumer goods and services, Interurbia expects to grow another 10% this year.

Such a unique combination of growth and stability means unequaled security for gas producers supplying this modern City State of the Gas Age.. Via Transco, producers in Texas and Louisiana can tap the market where the most people are.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

▶▶▶ Equipment Men Notes

Brown Oil Tools, Inc. adds

. . . Lee Popham to its sales staff. Before joining the Houston firm, Popham had served as special service engineer and as a supervising research engineer. After obtaining his degree in petroleum engineering he served the oil industry not only in the United States but in other parts of the world.

J. F. McKeighan, Jr. appointed

J. F. McKeighan

. . . general sales manager of Cameron Iron Works, Inc.'s Special Products Division, according to J. W. Brougher, vice president and general manager of the division.

McKeighan, who will locate in Houston, formerly was West Coast sales manager for the division. Prior to that he served as sales manager and assistant marketing manager with a forging concern.

Forrest Goin named to manage

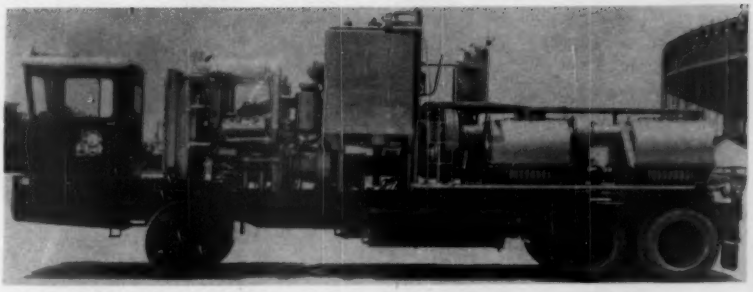
. . . the special-products department of Axelson Division of U. S. Industries, Inc. He will be responsible for the engineering recommendations, calculations, and installations of multiple-zone pumping equipment manufactured by the company. Goin will have under his direction two-zone specialists devoted exclusively to multiple-completion efforts.

Union Tank Car Co. begins

. . . construction of 12 more of the new 30,000-gal.-capacity railroad tank cars it introduced earlier this year.

The new Hot Dog-30 cars are said to be the largest-capacity railroad tank cars in the world. They will be leased to the Baton Rouge refinery of Esso Standard, division of Humble Oil & Refining Co., and are scheduled to be put into service during September carrying ethyl ether.

The 85-ft.-long cars will be made to the American Association of Railroads' specification 112A400-W, and will be assembled at Union's Whiting, Ind. plant. The tank shells are to be fabricated at the East Chicago plant of Graver Tank & Mfg. Co., division of Union Tank Car.



OIL-WELL-CEMENTING UNIT delivered by Stewart & Stevenson Services, Inc., to Mike Hicks Tools & Cementing Co., of Houston and Crowley, La., features 700 b.hp. that is controlled from a single location with finger-tip control. The unit is one of the Fieldmaster models. The chassis has an 18,000-lb. front axle, 34,000-lb.-capacity bogie, and features a specially designed one-man cab.

Baker Oil Tools, Inc. forms

. . . a manufacturing subsidiary in Mexico City—Baker Herramientas Petroleras, S.A. — according to T. Sutter, Baker president. The new concern is scheduled to begin operations late this year.

"The Mexican government plans a substantial increase in exploration activities over the next few years to keep pace with the increasing demand for petroleum products in that country," Sutter commented. "By manufacturing our products in Mexico, we should gain a greater share of this expanded market than is possible through export trade from the United States."

J. R. Baker, formerly Baker's chief research engineer, has been named manager for the Mexican operation. H. H. Fisher, Jr., replaces Baker as head of the company's expanded research facility in Houston.

FIRST DERRICK RIG produced by Fred E. Cooper, Inc., at its newly completed manufacturing facilities in Tulsa, is shown starting a trip to Canada. The location, at 3232 Sand Springs Road, is situated where the present plant was built and opened in 1937. Facilities now include a paint shop, fabricating shop, repair shop, and general offices.

B. F. Dugger takes over

. . . as manufacturer's representative for Herb J. Hawthorne, Inc., Houston, announces W. A. Davidson, sales manager for the exploration-bit-manufacturing firm. Associated with Seismograph Service Corp., Tulsa, for 15 years before joining Hawthorne, Dugger will work out of Midland, Tex., maintaining field contact with company customers and the network of Hawthorne dealers supplying exploration crews working the West Texas territory.

Jimmy T. Watson takes over

J. T. Watson

. . . as assistant to the manager of stores—S. G. (Doc) Wyatt—for Wilson Supply Co., and will operate out of the company's general office in Houston. Watson has been with Wilson Supply for 13 years. He formerly served as store manager at New Iberia and Beaumont, and prior to his new assignment, was district manager for the East Texas-North Louisiana area.

At the same time it was announced that Edwin W. Von Ruff had been made manager of Wilson's McAllen, Tex. store. Von Ruff has been in oilfield supply and equipment sales work in the area for the past 6 years.

Canadian Westinghouse Co. gets

. . . an order from Trans-Canada Pipe Lines Ltd. in excess of $2,500,000 for three 8,500-hp. gas turbines to act as compressor drives for a natural-gas pipeline to the United States. The three units will be manufactured at the Westinghouse plant in Hamilton, Ont., and are scheduled for shipment by

Kaiser Purocast castable is a better refractory material than you can normally buy in factory-fired burner blocks. Carefully blended low-iron, high-purity ingredients give it high resistance to spalling. Its high density—140 pounds per cubic foot—effectively reduces corrosive slag penetration.

The characteristic volume stability of Purocast makes it particularly suitable for high temperature burner blocks in the refinery oil heater.

Ask your Kaiser Refractories Sales Engineer how you can make all of your own burner blocks with Purocast—in your plant—and get these advantages:

Longer life without failure. Good uses of unassigned manpower to cast blocks in advance. Reduced inventory. Freight savings. And assurance that you can replace any shape block 24 hours after pouring—regain full heating in as little as 48 hours!

Call or write Kaiser Refractories & Chemicals Division, Dept. P6011 Kaiser Aluminum & Chemical Sales, Inc., at any of the offices listed below:

KAISER REFRACTORIES

PITTSBURGH 22, PA. . . . 3 Gateway Center
MEXICO, MISSOURI . . . Mex-R-Co Building
OAKLAND 12, CALIF. . . . 300 Lakeside Drive

Mexico Refractories now merged with Kaiser Refractories

KAISER REFRACTORIES, DEPT. P6011
KAISER CENTER, OAKLAND 12, CALIFORNIA

Please send me information about Kaiser Purocast with instructions for casting and curing burner blocks

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

midsummer. The turbines are a modified design, built for wide variations of temperature and load.

Milwhite Mud Sales Co. boosts

. . . Sidney A. Adger from vice president and director to senior vice president and director. The directors also

S. A. Adger

Ralph Noble

elected Ralph Noble to a vice presidency. The announcements followed Milwhite's annual sales meeting in Houston.

Infilco, Inc. appoints agent

. . . for British Columbia—Robert R. Alpen Industrial Equipment, Ltd. The announcement comes from E. G. Kominek, sales manager of the Tucson, Ariz. firm. Headquarters of Infilco (Canada) Ltd. are in Montreal, with branch offices and agents in Toronto, St. John, Winnipeg, Edmonton, and Vancouver.

Cal-Metal Pipe Corp. appoints

R. E. Johnston

. . . a new assistant sales manager in the person of Robert E. Johnston, Jr., announces R. C. Stewart, executive vice president of the Baton Rouge, La. concern. Stewart also reported that Dick A. Hall has become a sales engineer for the corporation.

Johnston, who joined Cal-Metal more than 3 years ago, most recently was southern district sales manager. He previously served as assistant branch manager of the Louisiana National Bank, and later was customer-relations director of a heavy-equipment-repair firm. Hall, who will locate at Baton Rouge, formerly worked in the research department of a pipeline company.

Plastic Applicators, Inc., buys

. . . Trip Check, electronic pipe-testing firm of Odessa, Tex., announces J. G. Duesterberg, president of the Houston-based company. Mobile pipe-inspection equipment was acquired in the transaction. This augments the instru-

NOW...

MID-CONTINENT COVERS THE OIL COUNTRY WITH RIG PARTS AND SERVICE CENTERS

To assure available field service for Mid-Continent drilling equipment, Mid-Continent now offers the industry strategically located service centers stocked with genuine Mid-Continent rig parts . . . parts guaranteed against defects in material and workmanship. This vast network of service centers, staffed with competent, factory-trained personnel, stands ready to make repairs 24 hours a day, with top priority for emergency breakdowns. In most cases, repairs are made on location—which means less rig shutdown time. Yes, whenever . . . or wherever . . . you need Mid-Continent parts or service, call your nearest Mid-Continent service or sales representative.

MID-CONTINENT—SUPERMARKET FOR THE OIL INDUSTRY

PS1-0

MID-CONTINENT SUPPLY CO.

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

Mid-Continent Building, Fort Worth, Texas • Export Division: 45 Rockefeller Plaza, New York 20, N.Y. Cable: MIDCUMPORT NYK

Burns Any* Oil That Can Be Pumped • Burns Any Fuel Gas

An unretouched photo of John Zink DB burner being fired in one of the John Zink research furnaces.

John Zink Series "DB"

Eliminates the operating and maintenance problems that are usually present in oil fired burners.

Replace your present oil burners with John Zink DB burners and do away with messy oil spills and high burner maintenance. Actual operating reports prove that the "change-over" quickly pays for itself by substantially reducing maintenance costs and improving operating efficiency.

* Ideal For Burning Pitches and Other Very Heavy Fuels
Burns High Hydrogen Gases, Too!

WRITE FOR BULLETIN D-59

INDUSTRIAL BURNERS / AIR HEATERS / DISPOSAL UNITS
INERT GAS GENERATORS

JOHN ZINK
COMPANY
4401 S. PEORIA
TULSA, OKLAHOMA

mentation bought last December when the Pipe Inspectors firm was obtained at Harvey, La.

J. H. Walsh named to succeed

. . . Gordon R. Carpenter as eastern division sales manager of Lufkin Rule Co., Saginaw, Mich. The move will permit Carpenter to devote all of his time to managing Lufkin's Middleton, N. Y. manufacturing division and office.

J. H. Walsh

Walsh started with Lufkin in 1956 as merchandise manager. Previously he was with the National Retail Hardware Association in Indianapolis and the New England Hardware Association in Boston. He will make his headquarters in New York.

Roger F. Meunier assumes job

R. F. Meunier

. . . as branch manager of the Westwego, La. branch of Delta Tank Mfg. Co., Inc., Oilfield Equipment Division, reports Frank Keller, eastern division operation manager. At the same time, Keller announced the appointment of Carl A. Carreca as sales engineer, and Harold L. Dupree as sales representative.

Meunier, prior to joining Delta in 1955 as office manager, served with another producer of petroleum equipment. Carreca joined the company in February as a sales engineer. He was formerly associated with an independent oil-field-supply company. Dupree joined Delta in 1957 as area office manager.

Midwest Piping Co., Inc. holds

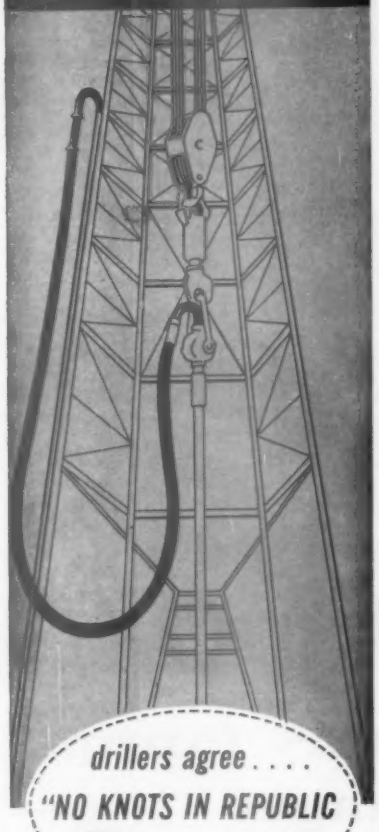
. . . its 1960 sales meeting in St. Louis for more than 50 persons, including 22 out-of-town executives, division managers, district managers, and sales representatives. Theme of the meeting was "A" Double Barrelled Sales Opportunity for 1960," suggested by Midwest's double line of welding fittings—seamless and welded types.

Wolverine Tube appoints two

. . . new district sales managers and a new sales representative.

T. E. Goodyear takes over as sales manager of the St. Louis district for the division of Calumet & Hecla, Inc.,

REPUBLIC ROTARY HOSE



drillers agree . . . .
"NO KNOTS IN REPUBLIC HOSE!"

Equal tension on each steel cable prevents knots.

REPUBLIC RUBBER
DIVISION, LEE RUBBER & TIRE CORP.
YOUNGSTOWN 1, OHIO

For information on Rotary, Mud Pump Suction or Vibrator Hose, write to: Republic at Youngstown or check your local J & L Supply Store.

102*

**102 — that's the number of Nelson high voltage starters* in use at just one of the many refineries using Nelson electrical control equipment.

This one refinery has been using Nelson starters for nine years.** What better evidence of complete satisfaction could be desired? Other industries such as paper mills, water and sewage pumping plants, and cement mills have also found that Nelson high voltage starters gave them the dependability and easy maintenance and installation so important to low cost operation.

This record of proven performance again confirms the fact that Nelson is

BIG ENOUGH TO PERFORM SMALL ENOUGH TO CARE

Be sure to let your Nelson representative figure your next job. You will find him listed in the Yellow Pages of major city telephone directories.

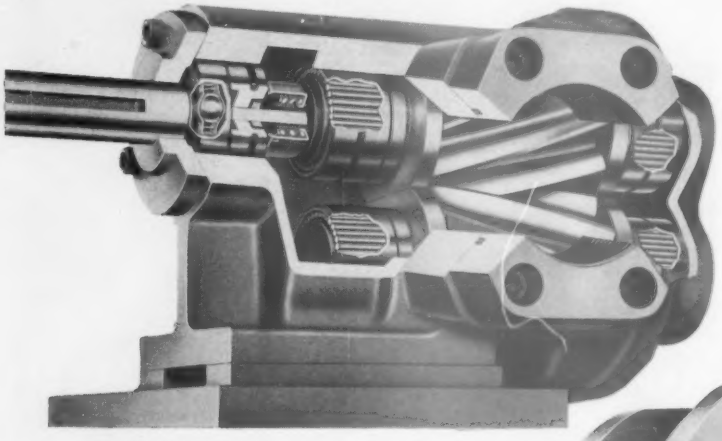
Write for your copy of the Nelson Pictorial Index.

*** Ask your Nelson man for the facts on this installation.*

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

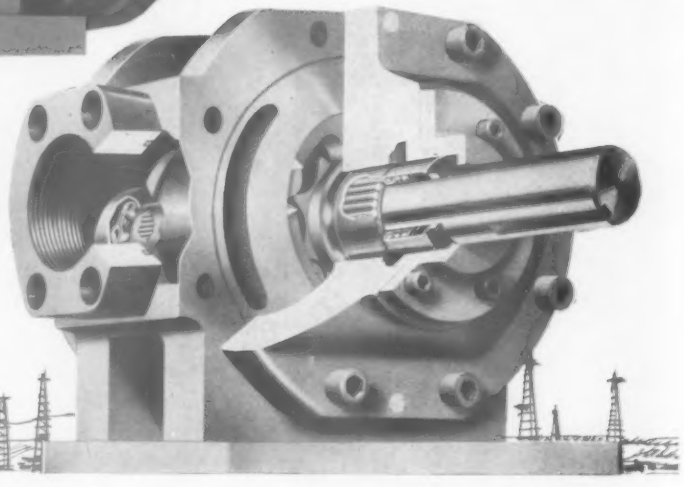
P. O. BOX 5385 RIVERSIDE 2-5531

Now from Brown & Sharpe,



New B&S Series 300, rotary-gear pumps are available for pressures to 300 psi; caps. of 40, 60, 90, 125, 175 gpm.

New B&S Series 700, gerotor-type pumps for pressures to 1000 psi; caps. of 20, 30, 40, 60, 80 gpm. (Note: This highly-efficient pump has unusually long life. Contact between its inner and outer elements progresses at only 1/9 driven speed.)



a brand new line of Rotary Pumps with 5 big advantages to cut maintenance costs

1 Standard bolts and screws are used throughout. If lost, they're quickly and easily replaced.

2 Simple, rugged construction. Pumps are easy to take care of because they're easy to understand.

3 Replaceable pipe flanges of ductile iron cost little to change if threads are damaged.

4 Roller bearings give you longer service from pumps before any maintenance is required.

5 Replaceable wear plates are easily changed — give new life to the pumps, after normal wear.

Reduced maintenance cost is just one of the reasons why you appreciate these new pumps. You save on installation and get longer life, too.

Brown & Sharpe Series 300 and Series 700 Pumps are designed specifically for the Petroleum Industry, to save you money right down the line.

Start saving now! Contact your local oil field supply store about new B&S Pumps. Ask them for a catalog, or write: Hydraulics Div., Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Brown & Sharpe PRECISION CENTER

and T. F. Vigmostad assumes the same post in the New York district. James J. Boyett has become sales representative in the San Francisco district.

Corrosion Rectifying Co. reports

. . . the undertaking of an expansion program that includes opening a number of branch offices, along with complete diversification of its corrosion - protection services.

Frank G. Melkie, former area production manager for Tidewater Oil Co. in Houston, has been named head of the company's division office in New Orleans.

Flash Perforating Co. stock

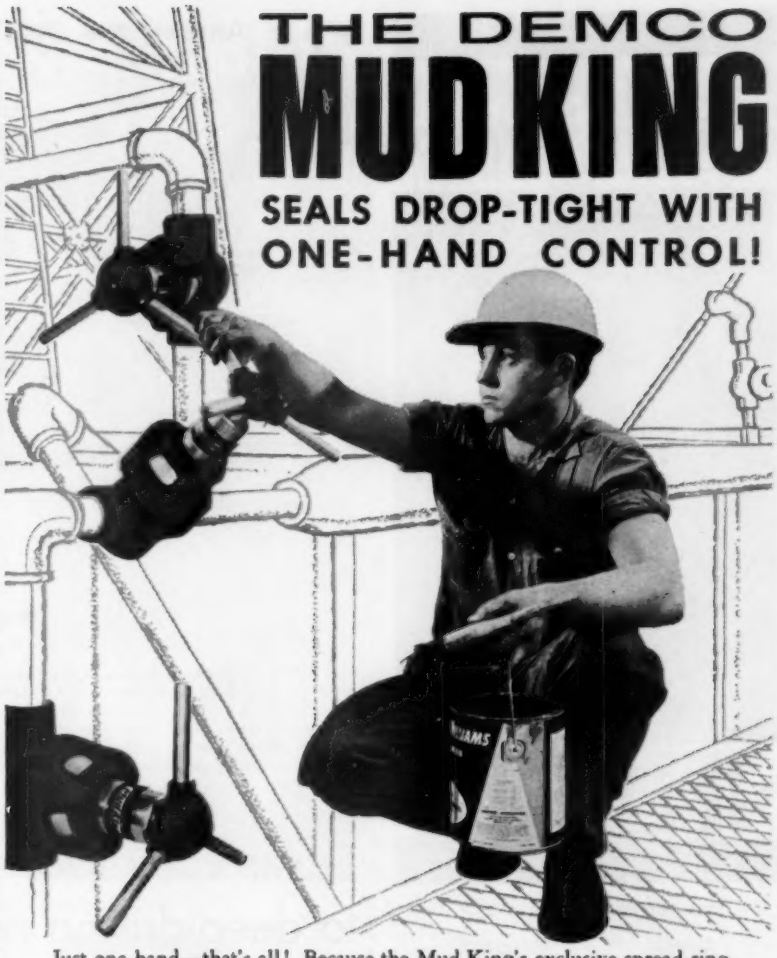
. . . is acquired by Marmon-Herrington Co. Officials of Marmon-Herrington say the firm has obtained 80% of the voting stock of the Abilene, Tex., firm.

Branch operations of Flash are located in Midland, Odessa, Big Spring, and Graham, Tex. Its services include radioactive logging, jet and bullet perforating, and Baker wire-line servicing. It is also a user of the cold cracker system, a servicing method developed by Marmon Herrington's subsidiary, Well Production Services, Inc., with offices in Chicago, Ill., and Duncan, Okla.

James Wester, who founded Flash, has signed a long-term employment contract to continue as president of Flash.

NEW STYLE COMPRESSOR of Allis-Chalmers Mfg. Co. is this "D" style scroll case, single-stage centrifugal unit located at an 8,000 bbl. per day cat-cracker plant at Sunray, Tex. The compressor is rated at 47,000 c.f.m. at 12.8 psia. and discharges at 17.5 psia. The unit is said to be capable of higher pressure ratios, greater volume, and wider flexibility than previous models.

THE DEMCO
MUD KING
SEALS DROP-TIGHT WITH ONE-HAND CONTROL!



Just one hand—that's all! Because the Mud King's exclusive spread-ring seat construction gives a positive seal against the highest line pressures *—without applying undue torque to the valve!*

And you get much more! Body remains in line while entire inner assembly lifts out for easier, faster inspection. Fewer parts are subject to wear. Self-lubricated stem threads are protected from abrasives by *double* stem seal.

Countless field applications have proved the Mud King to be equally effective in water flood, well-head, hydra-frac, acidizing and cementing services.

Add up DEMCO's *Plus Factors* and you'll agree—the Mud King will bring efficiency and economy to your operation, too!

AT SUPPLY STORES EVERYWHERE! In 2,000, 3,000 and 5,000 Lbs. W. P.

DRILLING EQUIPMENT MANUFACTURING CO.

845 S. E. 29th Street • OKLAHOMA CITY, OKLA.

LOST CIRCULATION?

JELFLAKE

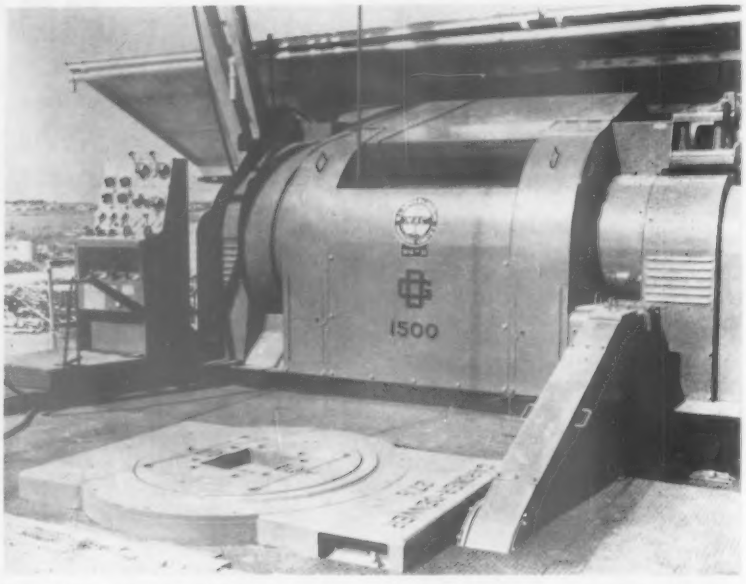
Jelflake® — fragmented plastic foil—is designed to prevent lost circulation, save mud money and hours of costly rig time. Get Jelflake **before** you drill. Condition your mud **as** you drill. Easy to use. Inexpensive. Try Jelflake. Low cost insurance where mud money counts. Jelflake is available at major mud distributors and all Dowell stations.

Products for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

DIAL DOWELL



THE FIRST 1,500-hp. draw works made by Gardner-Denver Co., Dallas, is now on Rig 11 of B. L. McFarland, Inc., Midland, Tex. This new equipment, purchased from Jones & Laughlin Supply Division, Tulsa, has eight forward and two reverse hoisting speeds, and four forward and one reverse speeds to the rotary table and catshaft. Air controls are used with hand and throttle conveniently located at the driller's position. Weight of the draw works with accessories is about 54,000 lb.

Texas contractor converts to deep-drilling rig

HOW DO drilling contractors upgrade their equipment to increase its flexibility? With the pinch of greater competition and deeper depth requirements, here's what one firm did:

B. L. McFarland, Inc., Midland contractor, wanted a rig that would go to 20,000 ft. The firm was seeking a flexible unit with ample power, yet economical in operation. The firm didn't want to buy an entire new rig so it considered what it had that could be used with new components.

They took their 142-ft. L. C. Moore mast and 18-ft. substructure and added to this existing equipment a new draw works, a three-engine sectional compound, three power units, two slush pumps, and a rotary table. The power units were three Waukesha VLROBU engines, and the slush pumps were two Gardner-Denver 1,000-hp. jobs.

The drum capacity of the new draw works with a 1¼-in. drilling line is 4,400 ft. The cathead shaft is chain-driven with a jaw clutch to permit disengaging the cathead shaft and drum drives while rotating. The countershaft is driven by a 1¾-in. pitch double roller chain from the rotary clutch shaft and is controlled by a Twin Disc master clutch. The skid-mounted draw works is 24 ft. long, 9 ft., 8 in. wide, and 8 ft., 1 in. high.

The three-engine sectional-type oil-bath chain compound is equipped with 24-in. Fawick motor clutches, 2 Fawick 28-in. pump drive clutches, 20 "D"-groove V-belt sheaves, and has quintuple compounding chains, quintuple chain drive to the draw works, and sextuple chain drive to the pump countershafts. All chains have 1½-in. pitch. Each compound is section mounted on H-beam skid frames with provisions for flanging and doweling to adjoining sections. Lubrication is by oil-pump force feed to all chains and bearings.

The Waukesha Model VLROBU standard oil-field power units are complete with radiator cooling, diesel pistons, gasoline-starting engine, butane-burning equipment and flywheels equipped with torque converters.

The 1,000 - hp. Gardner - Denver Model GR-GRX-L duplex power slush pumps have all standard equipment including slushproof liners, pistons, valves, seats, chromeclad piston rods,

and quick-change cylinder heads. The pumps have "Rigid Liner" construction and Model K-20 Hydril pulsation dampeners.

The Gardner-Denver Model RT-275 oil-bath rotary table has a 27½-in. table opening, a 53¼ in. center distance, a 20-tooth 2-in.-pitch double rotary sprocket, and an oil-bath rotary-drive chain guard with a 2-in. pitch double roller chain.

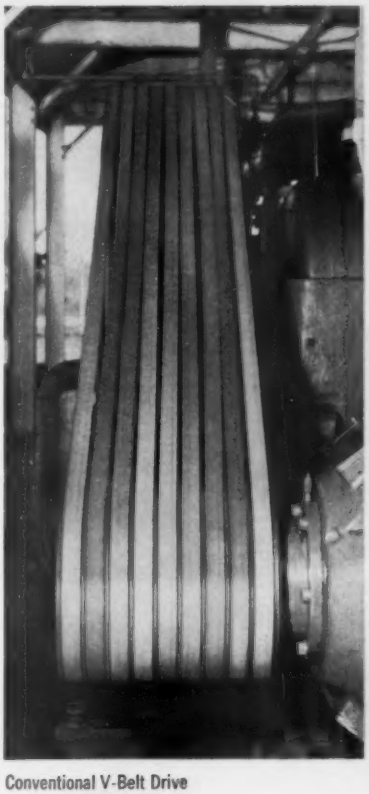
According to Rainey Elliott, president of Jones & Laughlin Supply Division, "The increasing competition and greater depth requirements in the contract drilling field have led many successful contractors, like McFarland, to reappraise their equipment. Deeper wells and reduced profit margins demand more powerful, yet more flexible rigs—rigs that will be able to dig the deep holes and yet be able to operate economically at lesser depths than are now required."

Active Rigs*

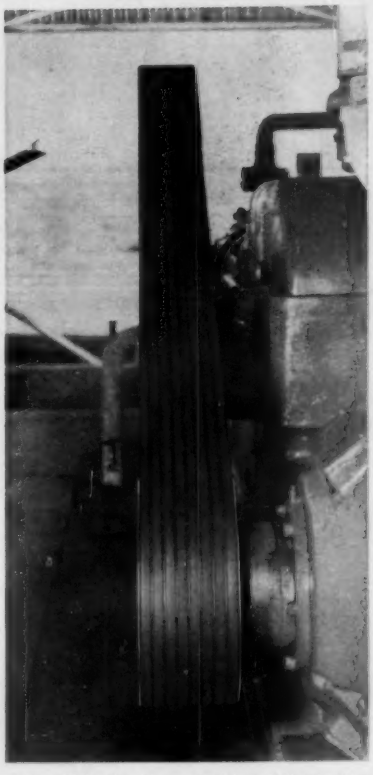
	Rotary	Cable	Total†
Alabama	3	0	3
Alaska	5	0	5
Arizona	2	0	2
Arkansas, South	29	0	29
California, Offshore	6	0	6
Inland	102	2	104
Colo., excl. Four Corners	18	7	25
Four Corners	8	0	8
Florida	2	0	2
Georgia	2	0	2
Idaho	0	0	0
Illinois	51	27	78
Indiana	13	20	33
Iowa	0	0	0
Kansas	101	25	126
Kentucky	12	48	60
Louisiana, North	106	0	106
South Inland	222	0	222
Offshore	60	0	60
Michigan	Not reported		
Mississippi	57	0	57
Missouri	1	1	2
Montana	24	1	25
Nebraska, East	2	0	2
West	19	0	19
Nevada	2	1	3
New Mexico, East	86	22	108
West	32	6	38
North Dakota	16	0	16
Okla., excl. Panhandle	255	74	329
Panhandle	34	7	41
Oregon	1	1	2
South Dakota	1	2	3
Texas, Offshore	1	1	2
East	76	0	76
Upper Gulf Coast	110	0	110
North	106	5	114
Panhandle	61	14	75
S.W., Corpus Christi	136	0	136
S.W., San Antonio	36	6	42
West	210	21	231
West Central	76	16	92
Utah, North	10	0	10
South	14	0	14
Washington	1	0	1
Wyoming	62	7	69
U. S. total	**2,174**	**314**	**2,488**

*Report to AAODC by the International Oil Scouts Association.
†As of June 24, 1960.

SAME JOB Fewer Belts . . . Narrower Sheaves Less Bearing Load . . . Lower Costs



Conventional V-Belt Drive



Thermoid-Quaker "Powerflex Wedge" V-belt drive

Quaker Thermoid "POWERFLEX WEDGE" V-BELTS SAVED $402 ON THIS JOB

The shape of new "Powerflex Wedge" V-belts is narrower with added depth . . . for a big jump in "pulling" power. More pull means fewer belts, smaller sheaves, shorter centers and less bearing load; *more efficient power transmission.* Costs on this documented "Powerflex Wedge" installation amounted to a savings of $402.14 over the conventional V-belt drive.

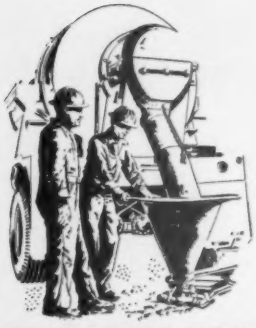
But design isn't the whole story! New Thermoid-Quaker rubber compounds and tougher, load-carrying cords play a vital role in prolonging belt wear . . . for even greater savings.

Check "Powerflex Wedge" V-belts for better power transmission. Your Thermoid Division Distributor is there to serve you. *Thermoid Division, H. K. Porter Company, Inc., 200 Whitehead Road, Trenton 6, N.J.*

THERMOID PORTER DIVISION

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.



DIACEL BRIEFS

CEMENTING DATA REPORT 60-2

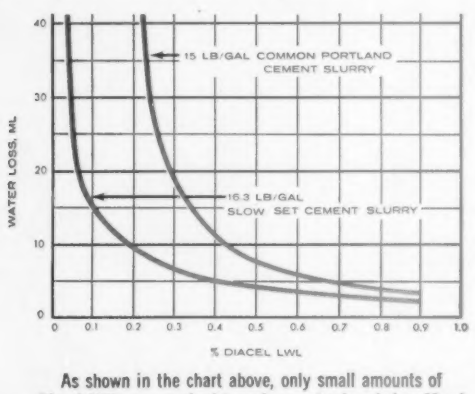
Better SQUEEZE JOBS Made Possible With Diacel* LWL—Low Water Loss Cement Additive

Cements with controlled water loss and thickening time are ideal for casing cementing. They are even more ideally suited for squeeze cementing. The success ratio of squeeze cement jobs has increased greatly with the use of Diacel LWL Cement Systems. These systems can be formulated from 10.3 to above 20.0 lbs./gal. and tailored to meet practically all thickening time requirements.

High Pressure Squeeze Cementing

Many times a high filtration or high water loss cement is dehydrated and left inside the casing opposite perforations and requires drilling out. Use of a Diacel LWL Low Water Loss Cement System in a high pressure squeeze job minimizes dehydration of the slurry to permit the entire perforated interval to be covered with cement. Such a Diacel LWL slurry can be washed or reversed out after the desired squeeze pressure has been reached, which eliminates the drilling of the cement from the casing. This permits other operations in the well, such as, perforating, drill stem testing and resqueezing without pulling the packer. The mechanics of the job are basically the same as those used on conventional squeeze jobs, except the initial pumping rates may be reduced. Hesitation pumping may be necessary to obtain desired squeeze pressures.

The following example of this improved squeeze technique took place in a field where zones require several squeeze jobs for successful completions.



As shown in the chart above, only small amounts of Diacel LWL are required to reduce water loss below 10 ml.

Problem: *A string of 5½" casing equipped with centralizers and reciprocating scratchers was stuck at 7507 feet, approximately 2500 feet off bottom. A 4½" liner was set with partial returns to total depth with top of liner at 7418 feet.*

The first attempt to obtain an effective seal was a 3-stage cement job requiring 550 sacks of slow-set cement placed on top of the liner. The well was perforated at 9113-20 feet and on test produced 1101 barrels of salt water with no oil at flowing top pressure of 2300 psi. Perforations were squeezed with 200 sacks of slow-set cement with a 2000 psi build-up. Cement was left opposite the perforations. After drilling the cement plug, the formation took fluid at 2200 psi.

Solution: To prevent another unsuccessful squeeze job, 225 sacks of Portland cement were mixed with 0.3 per cent Diacel LWL and 3 per cent Diacel A Accelerator. The desired surface squeeze pressure of 5000 psi was obtained when 200 sacks of this slurry had been pumped into the formation. After drilling out cement, the well was perforated at the original interval of 9113-20 feet. The well produced 182 barrels distillate and 1900 MCF gas with flowing top pressure of 3052 psi . . . the result of a most successful squeeze job.

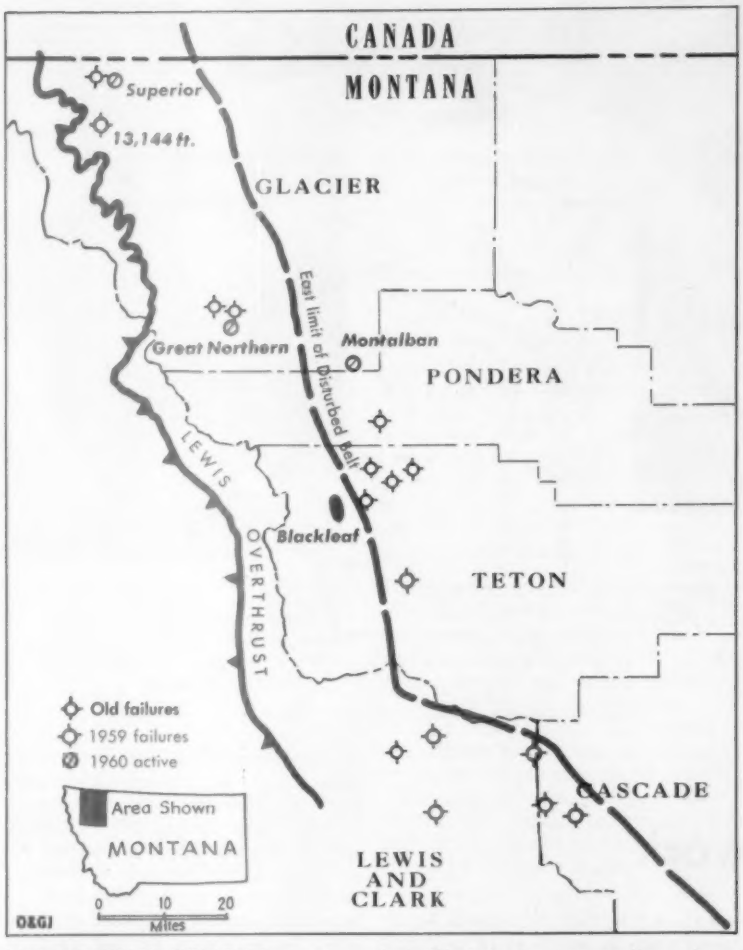
Summary of Advantages

Diacel LWL controls fluid loss and retards thickening time of slurries. It permits safe placement in deep high temperature wells and has proved successful in wells with bottom hole temperatures above 400°F. These low water loss slurries protect against pipe sticking, flash setting and pay zone water damage while cementing. Also, the chance of channeling and circulation troubles are minimized.

More complete data and information on Diacel Cement Systems may be obtained from your Drilling Specialties Company field engineers, your cement service company, or by writing . . .

*A trademark

DRILLING SPECIALTIES COMPANY
Bartlesville, Oklahoma



TWO IMPORTANT WILDCATS aimed at deep Mississippian targets have drawn special interest recently. Both are in Northwest Montana's Disturbed belt region. Deepest test ever drilled here was Gulf Oil Corp.-Shell 1 Tribal, a 1959 failure at 13,144 ft.

Wildcatters hit Disturbed belt on two fronts

BY FRANK J. GARDNER

ONCE AGAIN, Montana wildcatters will attack the challenging "Disturbed belt" that sweeps down out of Canada across the northwest corner of the state. Spudding in of one deep test, and announcement of a second, have made the region a center of summer attention.

Three are going down . . . Great Northern Drilling Co. has already commenced operations at its 1 Two Medicine Unit, Section 19-31n-11w, in Glacier County. This is a farmout from Union Oil Co. of California, a veteran wildcatter in the Disturbed belt. It calls for a 9,500-ft. test of the Madison section. If it succeeds, Montana Power Co. will take over the well at the casing point on a bottom-hole purchase basis. The wildcat lies only a half mile southeast of the much-publicized Union 1 Morning Gun, abandoned in 1955 at 9,556 ft. after flowing 6,000 M.c.f. gas and 250 bbl. of Madison condensate daily and declining rapidly to noncommercial status. It also lies about 3 miles southeast of a 1958 failure, the Shell Oil Co.-Union 32-X-10 Lewis, drilled to 10,066 ft.

Second wildcat announced for the belt in recent days is Superior Oil Co. 23-19 Blackfeet Tribal, in Section 19-37n-14w, also in Glacier County. This one will go to 12,700 ft. for a look at Madison possibilities in the Chief Mountain area.

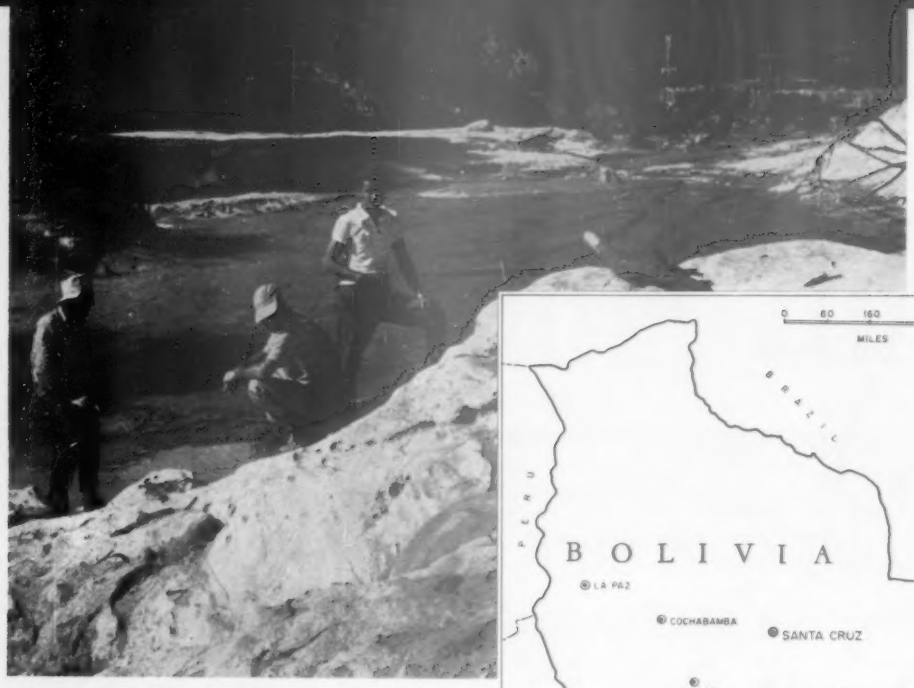
A third less-heralded explorer, now drilling toward a 5,500-ft. Madison target in Section 33-30n-8w, Glacier County, is Montalban Oils 1 De Ruwe "A".

In a complex region . . . Over the years, many wildcats have met with failure along this highly complex thrust zone (see map). Not until 1958 did one succeed. This was Northern Natural Gas Producing Co. 1 Blackleaf-Federal A, Section 12-26n-9w, in Teton County. The discovery was finished for 6,297 M.c.f. gas per day from the second Madison-Mississippian overthrust at 3,830 ft. after drilling to 6,323 ft. and bottoming in Madison there. Every approach in the book was used in this operation—surface geology, subsurface geology, and seismic survey preceded the drilling.

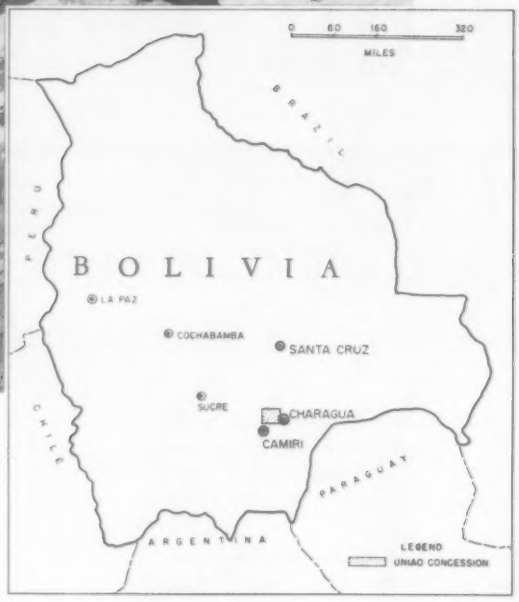
Northern's second well at Blackleaf was much smaller than the first; the 1 Blackleaf-Federal B made only 969 M.c.f. gas per day from Madison at 5,300 ft. It was completed in July 1959 in Section 19-26n-8w, as a southeast offset to the discovery.

This encouragement led to new interest in the belt's chances for commercial fields. It was compounded late in 1959 by British American Oil Co., Ltd.'s strike at Lookout Butte in southern Alberta, just 5½ miles north of the Montana border. Here, in LSD 11-31-1-28-W4, the Turner Valley - Mississippian paid off with 18,600 M.c.f. gas and 1,860 bbl. of 52° condensate per day through tubing from 12,104 ft. Termed a "major discovery" by Canadians, the well had an open - flow capacity of 31,000 M.c.f. gas plus 100 bbl. of condensate per million cubic feet.

With a major field only 8 miles northwest of it, and on a similar structural anomaly, Superior is gambling on another Lookout Butte. Great Northern, about halfway between Lookout Butte and Blackleaf, and fortified by the strong Morning Gun showings, has a better-than-even chance of succeeding. Both wildcats are keys to the future of the Disturbed belt.



Courtesy of
Kerr-McGee News



GEOLOGISTS recently studied surface rocks in the Uniao area, Bolivia, in preparation for exploratory work there. The Uniao concession area covers about 600,000 acres northeast of the city of Camiri. Terrain ranges from mountains on the west to plains on the east.

Bolivia is target for exploratory work

DECLINE in tin production in Bolivia has caused this South American country much economic woe of late. It is hoped that the success of the oil industry will help restore the national wealth.

History. The first oil found in South America was in Bolivia in 1875. There are many prospective oil areas lying along the 650-mile eastern sub-Andean arc from Peru to the Argentine border.

This summer, drilling operations should begin on a Brazilian corporation's 600,000-acre tract northeast of Camiri. Kerr-McGee Oil Industries, Inc., Oklahoma City has contract for an exploratory program for Uniao Brasil Bolivia de Petroleo S.A., a Brazilian company comprised of prominent business men of that country. This contract provides for technical aid by Kerr-McGee, Ltd., a wholly-owned subsidiary, to help in the planning, supervision, guidance, and

THESE JEEPS were flown to a nearby ranch and unloaded on a cheese truck. Pack mules must be used to reach almost inaccessible locations.

INSPECTING an exploratory well drilled before World War I are George Parks, left, and Ken Parker. Water in the region contains much salt. Drilling water will come from rivers, lakes, or water wells.

management of exploratory, drilling, development, and production operations.

Headquarters. Project superintendent, Ken W. Parker, left early in March to set up headquarters at Santa Cruz. An advance base was established in Charagua. Parker began making preliminary arrangements for getting the work started.

Remote area. The Uniao concession is in a remote area of Bolivia. The western part lies in the sub-Andean mountains, the center section is in heavily wooded terrain, while the eastern part extends out onto the plains. There are few roads and inadequate railroads for equipment transportation. Nearest commercial airport facilities are 120 miles from location.

Exploratory work began late in March when John McGinley, staff geologist for foreign exploration, arrived in Bolivia. Geophysical surface work should be completed and the initial well location determined by July 1. Drilling equipment will be moved into the concession in June or July, as soon as the temporary "dry season" railroad crossing of local stream beds is finished.

Equipment. The company has three heavy-duty oil-field trucks, one of which is all-wheel drive with tandem floats, a D-8 Caterpillar, motor grader, portable generators, and water-purification plants. Several jeeps, nylon tents, cots, and radio equipment have already been flown into the area for use by the advance party. When actual drilling operations begin, Kerr-McGee will furnish equipment and supervisory personnel. Labor will be done by Bolivian nationals.

Remote Williston field will get four extensions

Location has been made for four field wells in Dwyer field, Sheridan County, Montana. Mobil Oil Co. will go to Mission Canyon between 8,000 and 8,200 ft. Two offset production; two are about 1 mile south of production.

Mobil will drill F-11-28-P Seven in C NW NW 28-32n-59e, southeast of the discovery; a south offset to the confirmation is F-33-29-P Rasmussen, C NW SE 29-32n-59e. The south outposts are F-33-32-P Hoffelt, C NW SE 32-32n-59e, F-13-32-P Hoffelt, C NW SW 32-32n-59e. The discovery well was F-44-20-P Mueller, a January discovery of 51 bbl. per day from Mission Canyon at 8,011-12 ft. It was then reworked to pump 189 bbl. per day at 8,024-29 ft. The confirmation well, a southwest extension, is Mobil F-31-29-I Federal, NW NE 29-32n-59e. That well flowed 373 bbl. of oil cut 2.9% in 21 hours from Mission Canyon at 7,960-76 ft. This field lies 1 mile west of the North Dakota line, 40 miles southeast of Outlook field, and 50 miles northeast of Poplar field. Nearest North Dakota production is 50 miles east at Tioga field. Discovery of oil in the Dwyer area late last year was considered one of the exploratory highlights of the year for the Williston basin. Its great distance from production and its location in the central deep portion of the basin make it one of the most important oil finds since Outlook field.

Confirmation to Raven Creek field in Wyoming

The confirmation well to new Raven Creek field in Campbell County, northeastern Wyoming, pumped 339 bbl. of oil daily from Minnelusa Pennsylvanian perforations in two zones between 8,424-42 ft. The Shell Oil Co. 14-11 Williams, SW SW 11-48n-66w, is the first offset to the Kewanee Oil Co. discovery at 1 Norman in NE NW 14-48n-69w. That Powder River discovery pumped 440 bbl. of oil per day from perforations in the Minnelusa at 8,838-65 ft. Shell's well is a northwest offset success.

Shell 41-15 Williams, a west extension in NE NE 15-48n-69w, is drilling below 8,000 ft. Kewanee Oil Co. has spudded 1 Government-Bell in C SW NE 14-48n-69w as a southeast extension try. Kewanee's original discovery was a new pay for Raven Creek, a Dakota Cretaceous producer (1 well).

Intermountain geologists to tour Nevada area

The Intermountain Association of Petroleum Geologists and the Eastern Nevada Geological Society have joined forces to present the areal and economic geology of East Central Nevada with a conducted field conference and guidebook.

An excellent sample of the Basin and Range province with a variation in structure from the simple to the complex and a nearly complete section of Paleozoic and Tertiary stratigraphy will be presented as a supplement to the economic geology of the area, which includes Eagle Springs oil field and the famous open-pit copper mine at Ruth.

This field conference will begin September 8, lasting through September 10. For forms and information, contact D. M. Robinson, IAPG-ENGS, P. O. Box 269, Ely, Nev.

First of seven midwest maps ready

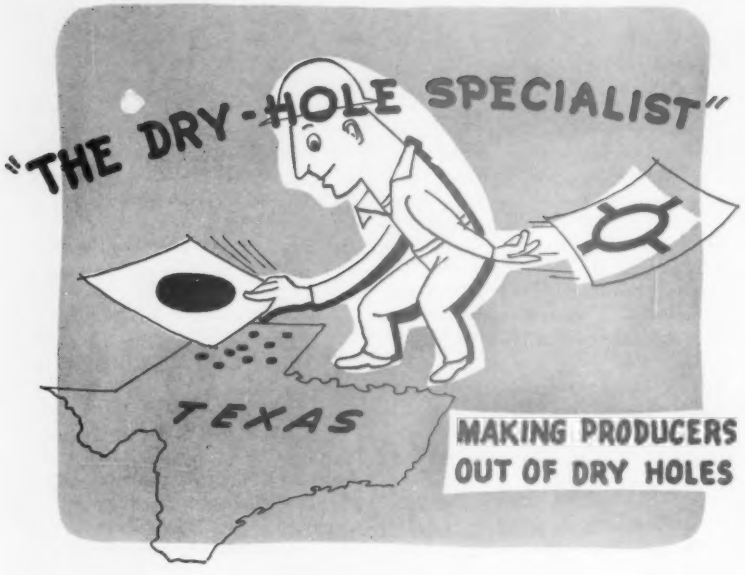
The first in a series of seven atlases intended to eventually cover all of Texas, Oklahoma, Kansas, Louisiana, and Mississippi, has been released by Whico Map & Publishing Co., Box 1104, Houston.

This first release covers South Texas and the Texas Gulf Coast, Railroad Commission Districts 1, 2, 3, and 4.

The atlas consists of a spiral-bound series of individual county maps in five colors, showing oil and gas fields, pipelines, highways, drainage and surface. Each county is on a separate page, and the presentation is replete with details.

Besides the individual county maps, the atlas contains a complete index to oil and gas fields, and an index to every land survey in the area of coverage.

This is something that has long been needed by the industry as quick reference material. The atlas sells for $5.



A NEW TYPE of independent oil man, the "dry-hole specialist," is joining the ranks of the petroleum industry in the Texas Panhandle.

During the past 18 months, more than 50 new oil and gas producers have been added to the Texas Panhandle portion of the Anadarko basin through reentry operations. These include old producers which have had additional zones opened, old failures completed in originally penetrated sands, and deepened wells.

Economics—major role. Economics have played a major role in this type of operation. Often, a deep venture in the Texas Panhandle, or for that matter anywhere, must be plugged even if oil or gas shows have been obtained. Cost of drilling the hole and completion costs and the payout of these costs are vital factors. A complete tax writeoff of the drilling costs of the well in many cases outweighs a further monetary outlay for casing and completion costs when the payout period appears too lengthy.

The well is abandoned and these economics change immediately for everyone except the original operator.

To the alert independent with a combined knowledge of geology, engineering, and economics, this same well which was cheaper to plug than complete for the original operator, can become a profitable producer. This is due solely to the fact that the cash outlay with the hole already drilled is much less and in turn makes the payout period shorter.

Pioneers. Pioneering the "dry-hole oil business" in the Texas Panhandle are a pair of Amarillo independents.

BY KENNETH CHASTEEN
Managing Editor
Dwight's Panhandle Oil Explorer
Amarillo, Tex.

Combining study of engineering and geology at the University of Texas and the Texas College of Mines in El Paso with managerial experience in mining and a retail outlet, the Ridgmorr Oil Co. has been formed. Equally well known by their operations as Ridgeway & Morrison, Pan-Petro, Inc., and as associates of the late J. A. Pitman, Hereford, Tex., financier, these independents have caused a total of 67 wells to be drilled in the Texas Panhandle. One failure is included in the total.

Most of these successes have been shallow in the Texas Panhandle oil and gas field; however, a quarter of the producers have been deep tests in the Anadarko basin portion of the Texas Panhandle and half of these have been reentered failures, the completion of which instigated the drilling of the other half.

Began in 1957. Ridgeway and Morrison entered the dry-hole recompletion business in 1957 with J. A. Pitman. In quick succession, the 1 Swink in Section 7, Block 12 of the H&GN Survey and the 1 Lance in Section 6, Block 13 of the T&NO Survey, both in Ochiltree County, were completed as gas producers.

The 1 Swink was opened at 8,276-83 ft., 8,192-8,201 ft., 8,058-60 ft., and 8,068-78 ft. and treated to potential for an open flow of 1,370 M.c.f.d. with a shut-in pressure of 1,423 lb. Open flow on the 1 Lance was 1,390 M.c.f.d. with a shut-in pressure of 1,930 lb. from treated openings at 8,290-8,306 ft. and 8,436-48 ft.

Reserves on the Lance have been set at 10,100 M.M.c.f. with 75,600 bbl. of condensate in place. An 85% recovery factor is estimated. Figures on the Swink are comparable.

These first rework operations successful, Pan-Petro, Inc., reentered the Underwood 1 Helton in Section 127, Block 13 of the T&NO Survey in Ochiltree County. Opened at 8,464-84 ft., the well finaled for 1,277 bbl. oil daily with a gas-oil ratio of 1,597-1. This was in July of 1959.

That same month, Ridgmorr Oil Co. cleaned out and washed with 500 gal. of mud acid at the old Humble 1 Merydith in Section 469, Block 43 of the H&TC Survey of Lipscomb County for an open flow of 1,450 M.c.f.d. and 3 bbl. of condensate per million. Shut-in pressure was 1,891 lb.

In November of 1959, Ridgmorr reworked an old Sinclair 9,550-ft. failure in Section 65, Block 13 of the T&NO Survey in Ochiltree County and finaled it as a dual-zone gas producer. Designated the 1 Trew, the well had an open flow of 460 M.c.f.d. with a shut-in pressure of 1,752 lb. from the Novi at 8,180-8,200 ft. and 1,950 M.c.f.d. with a shut-in pressure of 1,573 lb. from the Cleveland at 7,060-80 ft.

In Section 711, Block 43 of the H&TC Survey of Lipscomb County, Ridgmorr perforated the 1 Parker, a 10,320-ft. Humble failure, opposite the Cleveland at 7,730-42 ft. and finaled it for an open flow of 1,300 M.c.f.d. with a shut-in pressure of 1,503 lb. This was in April of this year.

By the middle of June, Ridgeway and Morrison reentered the Baker & Taylor 1 Wolfcreek-Park, a 9,346-ft. dry hole in Section 564, Block 43 of the H&TC Survey, and potentialed it for 2 M.M.c.f.d. with a shut-in pressure of 2,562 lb. from the lower Morrow at 8,952-56 ft. In Section 799, Block 43 of the H&TC Survey, Ridgmorr has deepened a 7,768-ft. failure to 9,860 ft. and set production tubing to total depth to test the Morrow. Three other reentries are planned for this year and the operators have taken over the Mayflo Oil 1-37 Banner-Gregg in Section 37, Block 4 of the GH&H Survey in Ochiltree County and are running casing to total depth 8,475 ft. in the wildcat.

Not alone. Although Ridgeway and Morrison have pioneered reentry of dry holes in the Texas Panhandle, they are not alone in this field. Numerous independents and major companies have been responsible for the number of successful reentries although none have appeared to special-

ize. Latest independent who apparently will play the dry holes is James F. Smith & Associates of Amarillo. A total of four successful reentries have been undertaken in the last few months by Smith and two other projects have been announced.

Independent geologists and landmen are taking a second look at their electric-log files and completion records as are the larger companies and independents. Reentries will continue at a brisk pace in the Anadarko basin unless the industry runs out of dry holes.

New dual-zone find for West Texas

West Texas' Nolan County has an important dual zone oil discovery at Thomas D. Humphrey Oil Properties, Ltd., 1 Rugh Boyd, an old well reentered.

The well recovered from Caddo lime at 6,222-34 ft. 700 ft. of oil and 359 ft. of oil-cut mud and mud-cut oil. A test in post-Ordovician detrital at 6,254-6,305 ft. got 3,255 ft. of gas in drill pipe, 280 ft. of oil and 174 ft. of heavily oil-cut mud. A test at 6,359-60 ft. got 1,383 ft. of free oil and 312 ft. of heavily oil-cut mud. Drill-stem test in the Ellenburger at 6,354-78 ft. got 32 bbl. of oil in 1 hour.

This new discovery prospect is 2 miles southeast of Sweetwater in Section 65, Block 21, T&P Survey.

Sooner oil news centers in north

Northwestern and northern Oklahoma counties figured highly in last week's exploratory news.

In Woods County, near Freedom, Ashland Oil & Refining Co. 1 Gerloff in C NW SE 27-27n-18w is a Tonkawa Pennsylvanian gas discovery. The well flowed 2,337 M.c.f.d. on 12/64-in. choke from perforations at 4,800-6 ft. From ¼-in. choke it flowed 3,206 M.c.f.d. On 20/64-in. choke the gasser made 4,248 M.c.f.d. Tubing pressure was 1,200 psi. This new discovery lies 4 miles northeast of Woodward County's South Edith field.

In Grant County, Sun Oil Co. 1 Wulz in C NW NE 28-25n-4w flowed oil to become the third producer for West Salt Fork field. The well made 10 bbl. of oil in 1 hour on ¼-in. choke from First Wilcox Ordovician sand at 6,018-28 ft. It then flowed 20 bbl. in 2 hours through the same opening with tubing pressure at 375 psi.

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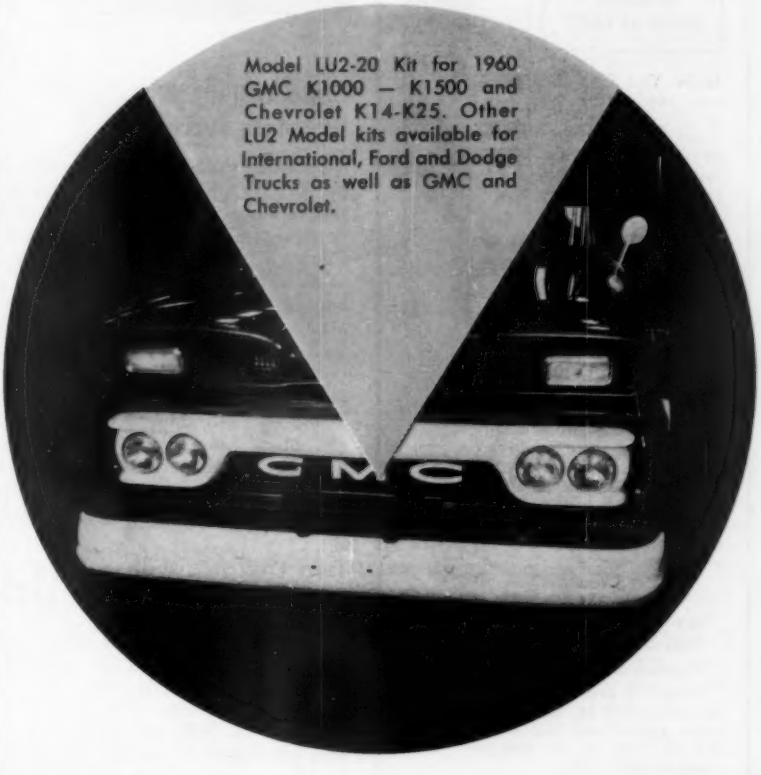
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area 3 miles from any production. The discovery well is Pan American Petroleum Corp. 1 State-J in C NE SW 36-24n-25w. It flowed 7,876 M.c.f.d. through ½-in. choke from Morrow Pennsylvanian at 8,093-96 and 8,192-96 ft. Potential was 26 M.M.c.f.d.

Kingfisher County's newest discovery is Cleary Petroleum et al. 1 Walker-B in C SE NE 2-17n-5w. The well flowed 20 bbl. of oil per hour from Oswego lime at 6,276-82 ft. through 24/64-in. choke for 7½ hours.

Ohio driller has sixth success

In Ohio, Atlas Exploration marked up its sixth straight success without a failure when its 1-A Lapp came in in north-central Lake Township, Stark County. The well logged the Clinton at 4,404-44, and gaged 3,959 M.c.f.d. natural, to make it the biggest in the play to date. The well was a ½-mile stepout.

Preston Oil reported a fine oil completion in its 2-Z Dewitt in Hopewell Township, Muskingum County. The well made 524 bbl. per day from the Clinton at 3,248-93 ft. Preston has an offset going to test the eastern edge of this Flint Ridge play.

Two Dakota wells added to San Juan coffers

Two Dakota gas wells were completed at Angels Peak in San Juan County, northwestern New Mexico. Aztec Oil & Gas Co. finaled 11 Hanks-D in NW SW 7-27n-9w, ½ mile northeast of production for 3,258 M.c.f.d. from perforations at 6,510-6,734 ft. Tennessee Gas & Oil Co. completed 1 Valdez Gas Unit-A in NE SE 24-29n-11w for 5,016 M.c.f.d. on ¾-in. choke from perforations at 6,107-6,282 ft. Closest Dakota production is 1 mile east.

Bear's Den field in Montana adds new pay

A new-pay discovery for Bear's Den field in Liberty County, Montana, is in prospect at Cabeen Exploration Co.'s 1 Lange in C NE SE 7-36n-6e. A drill-stem test at 2,423-65 ft. got 645 ft. of light brown to green oil. Top of Sunburst is 2,426 ft. and Swift at 2,436 ft. Production in this field is from Sunburst Cretaceous and Madison Mississippian gas. The Swift is the upper member of the Ellis-Jurassic group. It produces at several fields in the state—Kevin-Sunburst, Flat Coulee, Whitlash, and Cat Creek.

Nebraska's Morill County leads action

Still leading Nebraska Denver basin activity is Morrill County development.

Baumgartner Oil Co. and Falcon Seaboard Drilling Co. swabbed oil at the hourly rate of 15-20 bbl. on tests at the 1 Willson Ranch-A in C NW SW 8-17n-52w.

Perforations were in the "J" Dakota Cretaceous sand at 5,110-12 ft. Swab tests continue at this wildcat discovery 1¾ miles northeast of Cheyenne County's Willson Ranch field.

Kansas' Barber County has oil discovery

In Kansas, Crescent Petroleum Corp. announced the completion of a flowing discovery well, 1 J. C. Elsea on its block of approximately 1,500 acres in west-central Barber County.

The well, drilled as a stepout to Crescent's Mississippian gas well, 1 J. R. Rinke, found oil production in both the Marmaton and Viola zones. On test, the 1 Elsea flowed at the rate of 110 bbl. a day from the Viola on a 9/64-in. choke with 500-psi. tubing pressure. The Marmaton at 4,570-4,610 ft. on drill-stem test, flowed oil to the surface in 26 minutes at an estimated 50 bbl. an hour.

A confirmation well, 2 J. R. Rinke, 1,800 ft. southeast of the 1 Elsea, was completed in the Marmaton zone at 4,528-35 ft. Initial tests showed flow rates of 314 bbl. a day on a ¼-in. choke with 400-psi. tubing pressure.

Ontario summer drilling begins

The 1960 summer drilling season for Bluewater Oil & Gas, Ltd. in southwestern Ontario began with the spudding in of Bluewater et al. 24 B.F. West Williams in West Williams Township.

Objective of the well is a Guelph pinnacle reef, similar to reefs producing gas and oil in Lambton and Huron counties. The Grand Bend oil field 6 miles northeast, an Imperial Oil Limited operation, produces from this reef.

Pelee Island. Location is being surveyed for the first of two wells on this Lake Erie island. These wells will also test the Guelph. One of the wells will likely test down to the Trenton Ordovician. The Pelee Island wells will be drilled in partnership with Marine Oil & Gas Co., Ltd., a recently organized company in Windsor, Ont.

SEISMIC, surface, and drilling parties are taking advantage of the short and unusually warm summer throughout the 49th State as . . .

Oil hunters get busy throughout Alaska

THE 1960 summer exploratory campaign is under way in Alaska.

A great many companies have seismic, surface, and drilling parties in the state's many basins. Crews are busy from Dangerous River on the southeast coast, all around the Gulf of Alaska, through the interior, and onto the North Slope.

Kandik basin. The Kandik-Porcupine-Yukon Flats region apparently will bear the brunt of the exploratory attack this summer.

Continental Oil Co., Superior Oil Co., Sunray Mid-Continent Oil Co., and Honolulu Oil Co. will send a joint party of four geologists into the Kandik-Yukon flats this summer. This camp will be supplied from Fairbanks by fixed-wing craft and helicopter.

Humble Oil & Refining Co. will have a party doing surface exploratory work, headed by A. E. Hartwig, in the Kandik-Porcupine basin. Hunt Oil Co. have a proposed drilling venture northeast of Fairbanks. The firm plans seismic exploration there this summer. Drilling plans are not yet detailed. Hunt made gravity surveys in the upper Yukon flats last summer.

Shell Oil Co. will have one party in the Kandik basin this summer. Sinclair Oil & Gas Co. has a party in Central Alaska where exploration began May 20 in the Kandik basin. The party plans to spend a month exploring the area north and east of the Yukon River.

Susitna basin. British American Oil Co. has not detailed its summer plans, but is reportedly doing seismic work in the Susitna basin now.

CAMPS like this have sprouted up throughout the interior of Alaska this summer.

BRISTOL BAY AREA, ALASKA

COMPOSITE COLUMNAR SECTION

ERA	PERIOD	DIVISION	FORMATION	APPROX. THICKNESS	LITHOLOGIC CHARACTER
QUATERNARY	PLEIST.			Est. 1,000 Ft. ± Maximum	Sand, gravel, silt, clay, till, and ash.
CENOZOIC	MIOCENE & PLIOCENE			2,000 Ft.±	Marine siltstone, sandstone, and conglomerate. Note: The upper 2000 Ft. of section in the gen. pet. Great Basins 1 & 2 wells has been tentatively assigned to this time interval.
CENOZOIC	EOCENE	Upper		7,500 Ft.±	Nonmarine sandstone, siltstone, and conglomerate with thin seams of lignite
CENOZOIC	EOCENE	Lower		2,500 Ft.±	Volcanic rocks and sediments The volcanic rocks are chiefly basaltic lava, but include volcanic ash, tuff, conglomerate, and agglomerate. The sediments are principally tuffaceous sandstone and siltstone with some carbonaceous shale.
Note: Eocene and late Cretaceous rocks are probably conformable in the deeper parts of the Bristol Bay Basin.					
MESOZOIC	CRET.	Late	Chignik	?	Marine sandstone with minor amounts of siltstone, shale, conglomerate, and lignite. Locally petroliferous. Note: These beds do not crop out in the Bristol Bay Area. Their nearest known surface occurrence is at Chignik Lagoon, 100 miles south of Pilot Point.
MESOZOIC	JURASSIC	Upper	Naknek	9,000 ft. ±	Silty sandstone, Arkosic sandstone and conglomerate, dominantly marine.
MESOZOIC	JURASSIC	Upper	Shelikof	5,500 Ft.±	Siltstone and sandstone with some conglomerate.
MESOZOIC	JURASSIC	Middle	Kialagvic	1,800 Ft.± Exposed at Surface	Shale, sandstone, and conglomerate. Note: Middle and Lower Jurassic rocks are probably in excess of 5,000 ft. thick in the vicinity of 1 Humble Bear Creek
MESOZOIC	TRIASSIC			?	Note:A series of intricately intruded and highly indurated black, flinty, shales with thin interbeds of sandstone and limestone which crops out in the vicinity of Kulukak Bay has been tentatively assigned by the writers to the Triassic period, largely on the basis of general lithology and degree of induration
PALEOZOIC		Lower?		?	Gneiss and schist.

OUR NEW STATE of many basins is one of complex geology. Here is the section of Bristol Bay area.

Koyukuk-Kateel basin. British Petroleum Exploration (Alaska), Inc., in the state for the first time, has been doing surface geology work in this basin since the middle of May. Areas checked were Nulato, Galena, Ruby, and Ungalik. The party will move on to Umiat May 31. The BP parties will stay on the North Slope until late August. Four geologists are in the party.

Dangerous River. Colorado Oil & Gas Corp. completed seismic work in the Yakutat area last year. The company hopes to spud in at the Dangerous River wildcat near Yakutat about July 1. Location of this important test is 17-29s-37e, CRM. Objective depth is 8,500 ft. or more.

North Slopes. Humble Oil & Refining Co. will have a party in northern Alaska this summer. H. G. Graham will be in charge. The company will set up and maintain its own camp, expecting to be in the field by June 1. Sinclair Oil & Gas Co. will have a party on the North Slope until about September 1. For the second year, Texaco Inc. will have a crew busy in this region. W. J. Hughes will be geologist-in-charge. Union Oil Co. of California may have parties on the North Slope this summer.

Bethel - Kuskokwim basin. Pan American Petroleum Corp. has development contract for 465,280 acres in the Napatuk Creek area of this basin in southwestern Alaska. It has drilled three stratigraphic core tests. This year's program will depend on the results of the current core hole drilling. The 1 Napatuk was drilled last year. No. 2 was quit in April at 1,423 ft. The 2-A well was spudded in May and is below 1,635 ft. Helping Pan Am here are Sunray, Bristol Bay, and Empire State Oil companies. Shell Oil Co. has a 5-year development contract for 450,000 acres in this basin. Western Geophysical Co. is reportedly doing seismic inspection for Shell in the flatlands.

Cook Inlet basin. Reports are that Pan American, Union, and Phillips are doing seismic work in the Tyonek region on the western shore of Cook Inlet near Beluga Lake. Pan American was unsuccessful bidder for offshore lands at Cook Inlet last winter. Union - Ohio, Phillips, Texaco, and Standard-Richfield, however, were successful in their bids for these offshore parcels.

Richfield, with Standard of California, is using Western Geophysical Co. for seismic surveys on the Kenai Peninsula. Standard will have a two-

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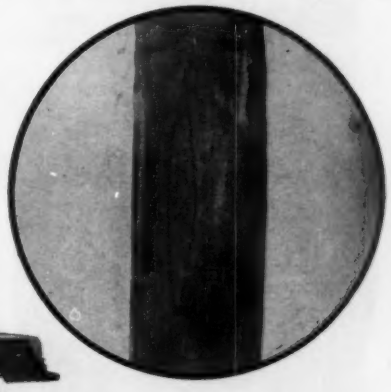
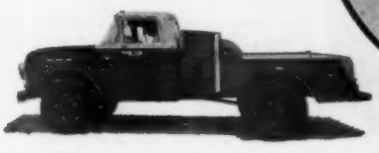


Impression of casing leak



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man crew doing surface geological work in the area until about July 15. Some seismic work may also be done. Texaco will have a crew at Cook Inlet this summer. Western Gulf Oil Co. plans exploration on the Kenai Peninsula this year.

Alaska Peninsula. Phillips has contracted United Geophysical Co., according to reports, to do marine seismic exploration in the Wide Bay area, southwest of Kodiak Island along the eastern shore of the Peninsula. A four-man party was on the Peninsula June 1. Western Gulf plans work on the peninsula this summer, also.

Katalla. Richfield is reportedly doing seismic work in this area in connection with their development contracts approved last year for exploring 489,622 acres (Contract 1) and 571,121 more acres, approved by Contract 2.

Copper River basin. Texaco Inc. will have a party in the Copper River area this summer. Gerry Ganapole will head the party at Copper River. The firm will also have a crew busy in Central Alaska. Carl Rogers will head this outpost.

Current developments. As of the middle of June, only one well was drilling in the state. Standard-Richfield's third well on the Soldotna Creek unit was under way. The first wells here, the 41-4 and 32-4, were both good producers. One flowed 1,870 bbl. per day, and the other made from 700-800 bbl. daily.

New locations include Richfield 2 Kalikh in the Yakataga basin, NW¼ 28-20s-14e, CRM. Colorado Oil & Gas Corp. is getting ready to start at 1 Dangerous River. This Yakutat basin wildcat is in the NE¼ 17-29s-37e, CRM. Halasko-Halbouty 1 Alaska well in the Cook Inlet basin on the Kenai Peninsula will be drilling in SW¼ 21-6n-9w, SM.

Standard Oil Co. of California and Richfield Oil Corp. have staked location for another wildcat on their Soldotna Creek unit on Alaska's Kenai Peninsula.

The new well will be the Soldotna Creek unit 14-4 in SW SW 4-7n-9w. This is about 1 mile southwest of the Soldotna Creek unit 41-4, the discovery well for the unit. The 41-4 flowed at a rate of 1,870 bbl. daily through a ½-in. choke from the Hemlock sands at 10,228-10,585 ft. The crude was 35-38° gravity. The discovery was completed in mid-March.

Soldotna Creek may be an extension of the Swanson River unit field which Standard of California and Richfield are developing to the north.

In Swanson River, the operator has plugged back the 32-10 from a total depth of 12,029 after finding the Hemlock dry. A zone from 3,200-5,300 ft. will be tested for gas. The 32-10 is the most northerly test of the unit. It's bottom-hole location is about ¾ mile northwest of the discovery well.

Coastal Drilling Co. has the contract for both the Swanson River and Soldotna Creek wells.

Beacon Ridge is new Green River unit

The USGS approved the Beacon Ridge unit in Sweetwater County, Wyoming, on June 20. Texaco Inc. is unit operator and Union Pacific Railroad Co. has a participating interest. Texaco has four locations in 25-19n-99w. Two of these are Almond Cretaceous oil wells. The block contains 7,657 acres in the south part of 19n-99w. Section 36-19n-99w, inside the unit line, is not committed to the Beacon Ridge agreement. Gulf Oil Corp. has several good wells in this section. It lies north of Patrick Draw and west of the Arch area.

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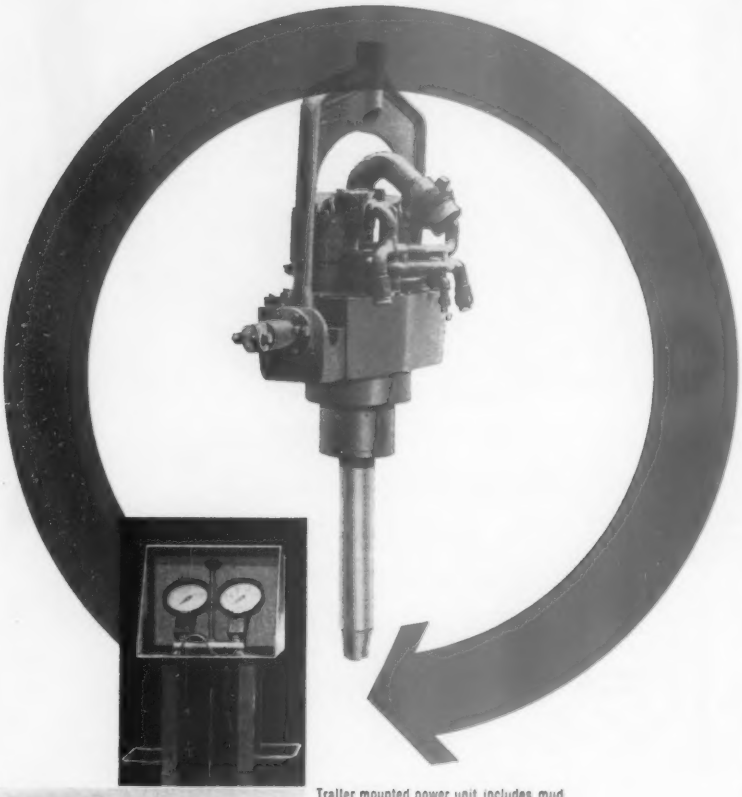

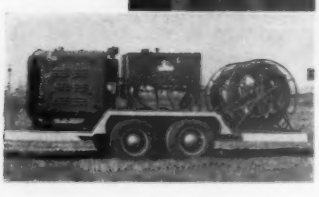

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Indiana leads Illinois basin drilling news

A new discovery in Posey County, Indiana, features the week's developments in the Illinois basin province.

Inland Producers Co. finaled 1 William Thomson-State Unit in NW SE NE 6-6s-14w for 103 bbl. of oil per day on pump. Production is from Tar Springs sand at 2,268-73 ft. Location is 8 miles northwest of Mount Vernon and over 1 mile from production.

In Knox County, 3 miles southeast of St. Francisville in NE SE NE 35-2n-11w, E. I. Barker 1 C. V. Kimmel-A-A Osburn is pumping from Aux Vases at 1,811-21 ft., natural. The well filled up 1,400 ft. natural in 4½-in. casing in 3 hours. This is a ¼-mile stepout.

In Spencer County, Shelby McIntosh has casing set at 1 Gilbert Harris in NW SW NE 24-5s-5w. This wildcat is 4 miles south of Santa Claus. It filled up 240 ft. natural in 16 hours from Aux Vases at 925-930 ft.

Illinois. In Fayette County, W. L. Beldon and R. H. Troop set casing to test Devonian at 3,472-75 ft. at 1 M. Gehle, in NW SW NW 18-5n-3e.

This ¼-mile stepout test is 3 miles west of St. Peter. A drill-stem test at 3,465-75 ft. got 3,324 ft. of clean oil, 90 ft. of oil and gas-mixed mud, and 60 ft. salty oil and gas-mixed mud.

In Madison County, M. J. Williams 1 Blom in SW NE 27-6n-6w, 1 mile south of Livingston, pumped 20 bbl. of oil per day, natural, from Pennsylvanian at 544-553 ft.

West Texas fields are consolidated by commission

The Texas Railroad Commission reports consolidation of Nolley Queen sand and Means Queen sand fields in Andrews County. This new field is Means Queen sand field, effective August 1.

Howard County discovery. Gartner Pennsylvanian reef is the name for a new field opened by J. C. Barnes Oil Co. at 1 Conrad in northeastern Howard County, 3 miles northeast of the town of Vincent.

The field discovery well is in Section 67, Block 20, Lavaca Navigation Co. Survey. Nearest production is 2 miles south at North Vincent. The well flowed 181 bbl. of oil daily on 14/64-in. choke from perforations at 7,353-7,408 ft.

North Texas. Southwestern Young County has a new Mississippian oil pool at Anderson Oil & Gas Co. 1

The Allar Co. "A." The well flowed 118 bbl. of oil per day through 6/64-in. choke from open hole at 4,572-87 ft. in Mississippian. Location is 4 miles southeast of Murray on the J. D. Jackson Survey, A-1464. Nearest production is Young County Regular field 3,300 ft. east. Nearest Mississippian production is 6,000 ft. north at Kendall, separated by dry holes. The new field will be called Allar Mississippian.

Taylor County. A new Jennings sand oil discovery for this county is Fletcher Oil & Gas Corp. 1 Emma Hankins, 10 miles southwest of Abilene. The well flowed 150 bbl. of oil per day through 18/64-in. choke from perforations at 4,989-95 ft. Location is in the Goliad CSL 143 Survey, 2 miles northeast of Southeast Inkum Cisco Reef field.

Significant Canadian well hits oil, gas east of Calgary

IN CANADA, Banff Oil, Ltd., and a group of New York businessmen headed by Carl Siegesmund have made a significant oil and gas strike in the general Cessford district of southeastern Alberta, 90 miles east of Calgary.

The province's newest discovery found natural gas in the Bow Island sand (southeast Alberta's Viking equivalent) and oil in the Detrital, which overlays the Mississippian. On drill-stem test, the Bow Island flowed at maximum rate 3,460 M.c.f.d. while the Detrital gassed at rate too small to measure but gave 340 ft. of muddy gassy oil from the pipe.

This well, Banff-Mobil 6-15-23-14 Matziwin, drilled on LSD 6-15-23-14w4, is 1¼ miles southwest of the Mobil 11-23-23-14 Matziwin basal Blairmore gas discovery well that had small showings of natural gas in the Bow Island, 2 miles northwest of an earlier test drilled by the discovery team, 5½ miles southwest of the Cessford oil and gas-field limits.

The general region in which the well lies has been fairly heavily developed and explored over the past few years but the new discovery will undoubtedly be followed up very shortly by at least the Banff team. Actually, in the immediate area, in addition to the Cessford gas and oil field and the Mobil Blairmore gas-discovery well are many indications of Viking, Blairmore and Cretaceous producers. However, a number of them have been followed up to some extent without further success—indicating minor accumulations.

At the new strike, an 11-ft. section in the first Bow Island sand was evaluate of the interval 2,580 to 2,625 ft. for 1 hour and during that time gas flow reached the equivalent of 3,460 M.c.f.d. In the Detrital horizon drill-stem test was run over a 34-ft. pay sector and 340 ft. of oil was recovered. There was no water in evidence on the test and gravity of the crude is estimated around the 30°.

More wells. This venture is only the second of an 8-to-10-well program that the Banff-Siegesmund group has scheduled in the central and southeastern sector of Alberta. The first in the program was abandoned while the third has been staked in the Hayter region, some 130 miles northeast of the discovery hole. While the two wells in this district were drilled as Mississippian test, the remainder of the wells in the program have been set as Paleozoic evaluations with the basal Cretaceous as their main objectives.

The discovery well was drilled on lands acquired under farmout agreement from Mobil Oil of Canada, Ltd., as was the initial well in the program. For drilling it the team earned full interest in eight and one-quarter sections around the well but production is subjected to an override royalty to

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Mobil. The same held true in the case of the first well which was also a Mobil farmout. That tract, however, was in the form of a drilling reservation for which Mobil paid a cash bonus of $22,881.60.

Participation interest in the program is being shared: 75% by Banff Oil and 25% by the Siegesmund group.

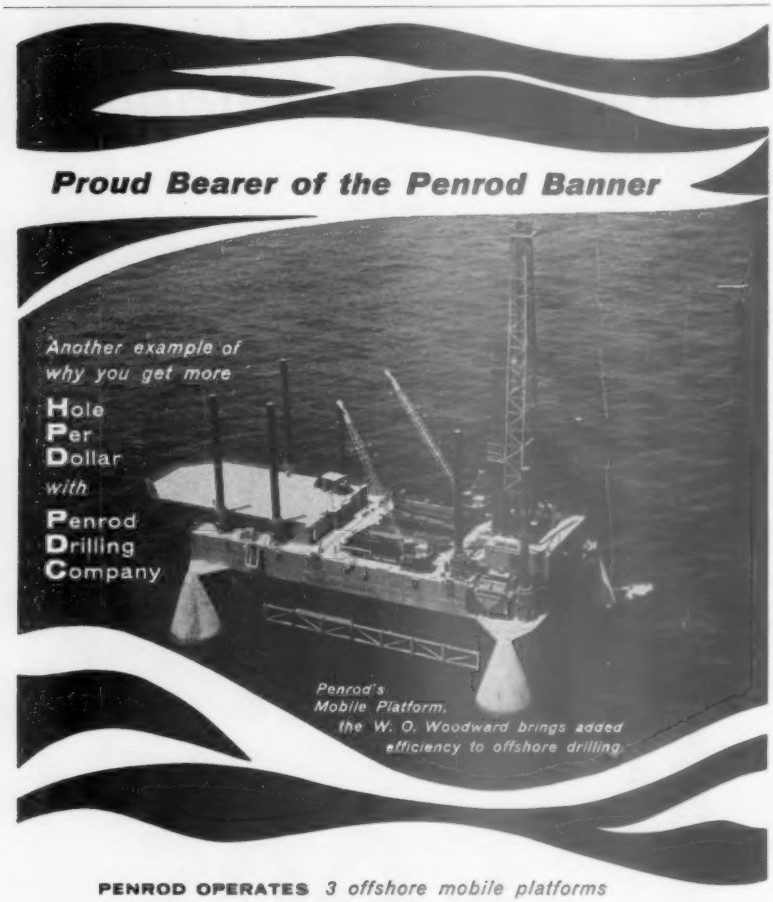
Colorado's Adams gets gas strike

In Adams County, Denver basin, northeastern Colorado, B. F. Allison completed 1 Dawson-Dinnsen in C NE SE 5-2s-57w.

The well flowed 1,200 M.c.f.d. and 18 bbl. of condensate daily from perforations in the Dakota "J" sand at 5,715-21 ft. This new field-opener is located 2¾ miles northwest of Badger Creek field.

Nebraska. The confirmation well to Fifer field in Kimball County, is successful. The well is Miracle-Fifer Drilling Co. 1 Evertson-A in C NW SE 30-16n-56w. It pumped 150 bbl. of oil daily from a casing notch in the "J" sand at 6,669 ft. It is the south offset and confirmation to a 1959 discovery at Evertson in C SW NE 30-16n-56w. That discovery pumped only 40 bbl. of oil per day and 245 bbl. water. The west offset was recently dry at 1 Hutchinson in SE NW 30-16n-56w.

Morill County, Nebraska. About 2 miles northeast of Willson Ranch field, Baumgartner Oil Co. and Falcon-Seaboard Drilling Co. swabbed oil at rates from 15-20 bbl. per hour from the "J" sand at a new discovery well. British-American got 15 bbl. per hour on swab of the "J" sand at another well 1½ miles southeast in the same area.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Permian program rolls in Kansas

A brisk Permian drilling program is gaining momentum in southwestern Kansas' Hamilton County. Three wells have production casing set for completion.

Near Medway Winfield Permian gas field, Hamilton Brothers, Ltd., 1-15 Cecil A. Tate "C," C SW NE 15-24s-41w, an east offset to the field discovery well, 1-5 Owings, and 1-33 Tracy are all new prospective producers.

Mayflo Oil Co. are completing 1-24 P. A. Craig in C NE SW 24-21s-42w as a shallow Permian gasser.

Important find for Oklahoma's Blaine

One of northwestern Oklahoma's most significant discoveries this year is Texaco Inc. 1 Sallstrom in Blaine County.

This Morrow Pennsylvanian discovery is in C SW NE 2-15n-12w, southwest of Watonga. Flow was 4,800 M.c.f.d. from perforations at 9,754-64, 9,776-88, and 9,798-9,807 ft. Choke size was ½ in. Condensate flow was 31 bbl. per million.

Nearest production to this remote find is 12 miles southwest at Squaw Creek field. That pool has Cherokee and Morrow production. Texaco's new find brings to four the number of producing areas in Blaine County. There is production at Squaw Creek, North Cooper, and Northwest Okeene.

Beaver County. At East Camrick Carter Division of Humble Oil & Refining Co. completed 1 Lehman in C NE SW 31-1n-20eCM. The well flowed 450 bbl. of oil per day from Morrow at 7,164-7,200 ft. The 2 Sager in C SW SW 35-1n-20eCM swabbed 260 bbl. of oil in 8 hours from the Morrow at 7,447-61 ft. Sohio Petroleum Co. 1 Wolf is a dual producer in N½ NE SW 21-4n-27eCM, at Highland field. It flowed

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When analyzing customer problems, the Pulp Laboratory engineers work closely with customer technical personnel, carefully checking every step along the way. This relationship insures *practical* results when the findings of the laboratory are put into operation in the customer's mill.

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35 M.M.c.f.d. from Chester at 6,834-58 and 70,500 M.c.f.d. from the Morrow at 6,731-91 ft.

Custer County. Mobil Oil Co. completed the third well in North Custer City field at 1 Webb Unit in C SE NW 23-15n-16w. The well flowed 13,400 M.c.f.d. from perforations in the Hunton at 14,174-14-638 ft.

Sooner State's Kingfisher is busy

OKLAHOMA'S Kingfisher County continues to be the busiest and most successful part of the state.

Apache Oil Corp. extended Southwest Kingfisher pool at 1 Sioux Unit in C NE SW 32-16n-7w. The well flowed 2,694 M.c.f.d. from perforations in the Manning Mississippian at 7,804-48 ft. Opening a new pay, the Layton sand, Apache got 10-12 bbl. of oil per hour on swab test from perforations at 6,350-60 ft. The 1 Duggan-Bowman in 8-5n-17w flowed 15,800 M.c.f.d. from perforations at 7,870-7,901 ft. to link Southwest Kingfisher field with North Okarche pool. Ohio Oil Co. 1 Vogt in C SE NW 29-15n-7w, on the south side of the Okarche area, flowed 8,100 M.c.f.d. from Manning at 8,160-78 ft.

In other areas of the county, Sunray Mid-Continent Oil Co. 2 Wells, C SW SW 22-18n-7w, linked Middle and North Dover fields with its 500-bbl. per day well. Flow was from Manning at 7,034-84 ft. Carter opened a new pay zone in North Hennessey field at 1 Huntsberger in C NW SW 11-19n-7w. The well flowed 24 bbl. condensate and 1,800 M.c.f.d. on ¼-in. choke from perforations at 6,779-95 ft. The regular field pay, Mississippi lime, was good for 172 bbl. condensate in 48 hours and 2,700 M.c.f.d. on ¼-in. choke.

The Cleveland sand is producing at Sinclair Oil & Gas Co. 1 Kudlac in SW SW 10-19n-6w at East Hennessey field. Swab got 24 bbl. of oil per day. Other pays in the well are Manning and Mississippi lime.

New field likely for Texas' Matagorda

Discovery of what is indicated to be another new field for Matagorda County, on the Texas coast, has been made by U. M. Harrison inside the city limits of Bay City. It is only 1 mile north of Lucky field but is expected to be designated as Harrison field.

Discovery well, 1 D. P. Moore Estate, is being dually completed with oil production from a Frio sand perforated at 10,221-27 ft. and gas from a deeper pay at 10,334-40 ft. Hole was drilled to 10,505 ft.

From the oil zone, the well flowed at the rate of 293 bbl. per day through 12/64-in. choke with pressure of 3,550 psi. Gravity of the oil was 31.5°. Gas-oil ratio was 808 cu. ft. per bbl.

Gas flow, through adjustable chokes, from the other zone was 1,928 M.c.f.d. Open-flow potential is rated at 14,400 M.c.f.d. Liquid recovery is in the ratio of 1 bbl. to 330 M.c.f. Its gravity is 46.7°. Top shut-in pressure is 3,622 psi.

Texas discovery confirmed

A recent gas-condensate discovery in the Long's Station area southwest of Village Mills, in northern Hardin County, Texas Gulf Coast, is being confirmed in the second well.

Both the discovery and confirmation wells were drilled by Atlantic Refining Co. The initial well (1-E Kirby) was dually completed last February with production from Wilcox sands at 10,045-50 ft. and 9,492-9,500 ft.

Confirmation well, 1-A Hardin County School Land, is 3,000 ft. southwest. It is being completed with perforations at 10,065-73 ft. While testing through ¼-in. choke, it flowed at the rate of 1,200 M.c.f. of gas and 50 bbl. of 49.5°-gravity condensate daily.

Nearest other field is East Village Mills, 2 miles northeast. Hickory Creek field is 3½ miles northeast.

Texas' Yorktown has two strikes

The Yorktown area in southwestern DeWitt County of Texas' central coastal region has come up with two additional good deep Wilcox discoveries.

Both are about 4 miles southeast of the city of Yorktown. One, by Commonwealth Oil Co. in a joint operation with Harkins & Co. and Humble Oil & Refining Co. is off the west side of Yorktown field. The other by Lion Oil Co. Division of Monsanto Chemical Co. in a joint operation with H. P. Darcy and Continental Oil Co. is southwest of the field.

Commonwealth's well, 1 Willie Machost, is dually completed. Its upper zone, perforated at 7,095-97 ft., is in Yorktown field's 7,100-ft. Upper Wilcox "A" reservoir, from which it is rated good for 3 M.M.c.f.d., open-flow potential, with 37.2 bbl. of 67.2°-gravity condensate per 1 M.M.c.f. Through adjustable chokes, it made 879 M.c.f.d. with pressure of 1,624 psi.

The lower zone is a new pay, the First Middle Wilcox sand, perforated at 9,895-9,911 ft. It flowed at the rate of 1,085 M.c.f.d. of gas through adjustable chokes, and has an open-flow potential of 4,100 M.c.f.d. It yielded 45.44 bbl. of 60°-gravity condensate per 1 M.M.c.f.

Monsanto's discovery well, 1 Walter Feller, is completed in Lower Wilcox sand at 9,524-38 ft. It flowed 1,689 M.c.f. of gas and 70 bbl. of condensate per day through 10/64-in. choke. A deeper Wilcox zone at 10,329-35 ft. also tested commercial gas-condensate production, but completion has not been tried in it. Several other zones at shallower depths had indications of production but have not been tested.

Commonwealth's discovery is one of a half dozen operations through this part of the state in which it has participated recently. It is on a 2,200-acre block, with location in the James Kimberling Survey. Drilling now is getting under way on a location on the Hugo Wuensch lease in the John York Survey, ½ mile northeast of the field.

Three nations seek Canadian oil finds

Canadian, American, and British oil and gas companies are well represented in the Arctic oil exploration permits granted June 24 when the time for validating priorities expired.

Total acreage taken up in the Arctic Islands was 39,046,000 acres, all covered by 12-year exploration permits, each permit covering a grid or a half grid. The smallest permit—half of one of the most northerly grids—covers about 23,000 acres, while the largest, covering one of the most southerly whole grids, is about 74,000 acres.

The areas selected under these priorities are in the central parts of the Arctic sedimentary basin, where the sediments are of phenomenal thickness, and where there are well-defined

(Continued on page 172)

LEGAL

SALE OF OIL AND GAS MINING LEASES, Department of the Interior, Bureau of Indian Affairs, Jicarilla Indian Agency, Dulce, New Mexico. Sealed bids will be received until 3:00 P.M., Mountain Standard Time, July 27, 1960, and then opened at that time in the office of the Jicarilla Indian Agency, Dulce, New Mexico, for the leasing of 37,262 acres of Tribal Indian land located in Rio Arriba County, New Mexico, within the Jicarilla Indian Reservation, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Jicarilla Indian Agency, Dulce, New Mexico.

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In addition to the E-P qualities, you get many other advantages with Seeco-Mul. Inasmuch as Seeco-Mul is a chemical emulsifier with superior wetting abilities, it is often run in so-called "soap" drilling fluids (the addition of detergents to fresh water muds, oil-and-water, and water-clay systems) to lower the surface tension, thereby wetting the formation ahead of the bit and keeping the bit clean. Such systems also afford a faster penetration rate and aid the suspended solids to drop out in the pits.

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[1] *McCutcheon, John W., "Synthetic Detergents."*

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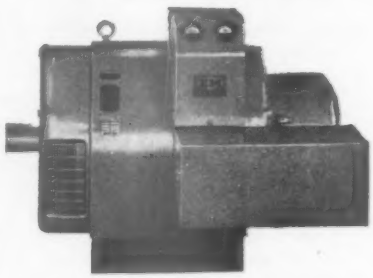

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Wayne E. Glenn . . . "Why grumble with success?"

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. . . for the industry and opportunities for those who can find ways of living with it, Conoco's Wayne Glenn says.

CONTINENTAL OIL Co. is one oil company where an engineer with something on the ball can work his way out of a dead-end street.

The production department at Conoco offers the engineer an opportunity to grow in many directions, regardless of his specialty. Management jobs are open to him if he is qualified.

Wayne E. Glenn, general manager for domestic production, is a classic example. He helped to create the policy and, because of his own managerial talents, profited by it.

It was back in 1945 that Glenn, a production engineer in the old Ponca City, Okla., headquarters, helped establish the first engineering trainee program for Continental. There were three trainees—new college graduates—that year. Since 1950 the number has averaged 33.

The program gives an insight into Continental's attitude toward the engineer. The trainees receive 18 months of intensive study and experience in all phases of operations—from field to office, from clerking to research.

"You give them a working knowledge of the production department's operation when they are at their peak learning period," Glenn said at his Houston office last week. "You let them know what their education means in terms of profits. It costs us about $18,000 a man, but we get a rapid payout, in that they hit the job running, and there is very little turnover."

Early start . . . Wayne Glenn knew he was going to be an oil man when he was 8 years old.

He was born at Fort Worth in 1915 and reared in oil surroundings. His grandfather made a million dollars in the Ranger, Tex., boom and lost it all at Breckenridge a short time later.

Young Wayne carried water and repaired leaks for Texas Pipe Line gangs while still a junior high student, and later was an oil field roustabout while in high school and college. He spent 2 years at North Texas Agricultural College at Arlington, a year at Texas A. and M., and finally 2 years at the University of Oklahoma, where he earned his petroleum engineering degree in 1940.

Hired by Continental as a junior engineer, he worked first in West Texas, and later went to Hobbs, N. M., as a production engineer. After a stint with the Army, he moved into the Ponca City headquarters.

Back on the firing line, he spent nearly 5 years as regional engineer out of the Los Angeles office, 5 months in the same job at Houston, and then 5 years as assistant manager of production for the Rocky Mountain region in Denver. He sandwiched in two management courses in New York and at Harvard.

Meanwhile, Continental moved its headquarters to Houston, and Glenn went there 2 years ago as manager of all domestic production, the job he holds today.

What's ahead . . . Talented at handling men, Glenn also has a faculty for encouraging the use of technology and automation to the art of producing more oil with less money.

No pessimist in today's glutted oil markets, he points to Continental's 1959 all-time record in earnings, spending, and well drilling. And drilling this year is ahead of 1959.

"Sure, we have too much oil," he says. "But if we are smart enough through automation and improved technology, we can at least be competitive, and we can live with our success in increased production. Why grumble with success? Our energy requirements are growing, and we can make money because we do the job cheaper.

"This is a big challenge and opportunity—an opportunity for an engineer, or manager, to show what he can do. But no fuel is going to replace crude oil and gas in the foreseeable future—and we'd better have a good bank of it."

In the U. S. great reserves are yet to be found, Glenn believes. particularly in offshore Louisiana and in the Rocky Mountains.

Only 44 years of age, Wayne Glenn hopes to have a big hand in this development.

Only last month he was awarded an honorary doctorate at the Montana School of Mines, where he delivered the commencement address. And the title of his address—"A Career of Human Significance"—was no accident.

He told the students they will run into problems "which don't fit a slide rule or a computer." Learning to deal with people is as important to success as technical proficiency. Glenn has found that out himself.

●

Gus B. Baker, assistant to the western region exploration vice president for The California Co., has been appointed division geologist for the western division. He will headquarter in Denver. **G. C. Bailey** has succeeded Baker.

Personals

A. H. Hayes, senior assistant manager of the Whiting, Ind., refinery of Standard Oil Co. (Ind.), has been appointed manager of the planning division in the manufacturing department, Chicago general office. **R. G. Anderson,** superintendent of the light-oils division at Whiting, has been appointed an assistant manager. Hayes joined Indiana Standard in 1930. He had been superintendent of the light-oils division, assistant general superintendent, and general superintendent of the Whiting refinery before being named senior assistant manager in 1956. Anderson joined American Oil Co., an affiliate in 1942. He was named to the light-oils post at Whiting earlier this year.

HAYES

F. W. Lawton, senior project engineer in the New York engineering department of Texaco Inc., has been transferred to the domestic sales department, construction and equipment division. He will headquarter in New York.

A. G. Weber, head of the primary recovery section in Jersey Production Research Co.'s production division, Tulsa, has been given a temporary assignment with Imperial Oil Ltd. in Calgary. He will be assistant manager of Imperial's production research and technical services division. The appointment is effective September 1.

Floyd W. Bules, assistant general manager of retail marketing for Pure Oil Co., has been promoted to general manager of retail marketing. **Frank H. Allen** has succeeded Bules. **Joseph H. Askren,** manager of Pure's northeastern marketing division in Detroit, has been named regional general manager for northern marketing operations. He will headquarter in Chicago.

D. L. Fuller has been named vice president and assistant manager of Producers Pipelines, Ltd. He had been operations manager in Regina for the company. Fuller was with Imperial Pipe Line Co. in Edmonton before joining Producers Pipelines last year.

Eugene H. Miller has joined Clear Creek Pipe Line Co. in Wichita as engineer. He formerly was in Mobil Oil Co.'s crude-oil pipeline division in Kansas.

H. B Lemaire, line superintendent in Ventura, Calif., for Shell Oil Co., has been named northern division superintendent, pipeline department. He succeeds **F. B. Jensen,** who has retired after 34 years with Shell. **R. R. Marichal,** senior engineer for Shell's products line in Indianapolis, will succeed Lemaire in Ventura.

Northern Natural Gas Co. has announced nine major changes in northern region field personnel. **B. V. Steinbeck,** district superintendent in Sioux Falls, S. D., has been promoted to district superintendent in Ventura, Iowa, succeeding **H. F. Carr.** Carr has been named district superintendent in Ogden, Iowa. He succeeds **I. C. Wilkerson,** now district superintendent in Sioux Falls. **R. W. Wright,** Beatrice, Neb., district superintendent, has been named district superintendent in Owatonna, Minn., succeeding **A. A. Craig.** Craig has been transferred to North Branch, Minn., as district superintendent. **R. Q. Rizley,** who had been North Branch superintendent, has been named district superintendent in Lincoln, Neb. **C. W. Knaak,** Mankato, Minn., district superintendent, has been promoted to superintendent at Beatrice, Neb. **S. F. Baltzell,** Superior, Iowa, district superintendent, will succeed Knaak in Mankato. **K. J. Craddock,** crew foreman at Owatonna, Minn., has been promoted to district superintendent in Superior.

Hobart D. Ferguson, senior district staff engineer for Sunray Mid-Continent Oil Co. in Newhall, Calif., has been promoted to division reservoir engineer in Denver.

Charles B. Duke, director of Sun Oil Co.'s crude-oil purchase and sales division, has been named president of Sunoco Trading Corp., new Sun subsidiary. Sunoco Trading will work with purchase and sale of crude oil and petroleum products on a world-wide basis. Other officers of the new company are **D. E. Norris** and **Paul E. Macht,** both former assistant directors of Sun's crude-oil purchase and sales division, vice presidents; **Joseph T. Wilson, Jr.,** assistant secretary-treasurer of Sun, secretary and treasurer; **Edward C. Bevan,** comptroller; and **R. A. Paul, Jr.,** assistant secretary and assistant treasurer. Directors are **Richard R. Anderson,** director of production for Sun, and Bevan, Duke, Macht, and Wilson.

Albert Rozensky has joined Pennsalt Chemical Corp.'s corrosion engineering products department as technical service engineer in Natrona, Pa.

H. B. Wofford, Jr., district reservoir engineer with Gulf Oil Corp. in Roswell, N. M., has joined Producing Properties, Inc., in Dallas as evaluation engineer.

Robert A. Watkins, formerly with Pan American Petroleum Corp. in Casper, Wyo., has joined the Montana Oil and Gas Conservation Commission as petroleum engineer. He succeeds the late John B. Flugstad.

C. N. Tinker, division geologist for Shell Oil Co. in Centralia, Ill., has been transferred to the Denver area exploration staff. **I. A. Wyant** has succeeded Tinker in Centralia. **E. B. Maki,** engineer in Denver, has also been transferred to Centralia.

William W. Bryan, marketing vice president for Humble Oil & Refining Co. in Houston, has been named president of Humble's Esso Standard division. The appointment is effective August 1 when **O. V. Tracy,** now president of the division, will retire. Bryan joined the Standard Oil Co. (N. J.) companies in 1923. He was assistant coordinator of world-wide marketing operations for the parent company before being elected a vice president and director of Carter Oil Co. in 1956. He was named vice president, marketing, for Humble earlier this year. Tracy was vice president and a director of Esso Standard before being named president of the division last December.

BRYAN

Daniel D. Arden, Jr., staff geologist with Standard Oil Co. (Ohio), has been assigned to Spanish Sahara operations of the company. He will headquarter in Las Palmas, Canary Islands. Ohio Standard and Tidewater Oil Co. have a joint operation in the area. Tidewater is operator.

Fred Forward, Phillips Petroleum Co., has been elected president of the Indiana-Kentucky Geological Society. Other new officers are **James Kendall,** Kendall-Davis Drilling Co., vice president; **R. B. Sublett,** W. C. McBride Inc., secretary-treasurer. Executive committee members are **John Avila,** Ryan Oil Co., and **Dan Sullivan,** Indiana Geological Survey.

▶▶▶ Personals

Joe J. King, senior vice president of Tennessee Gas Transmission Co., has been named a fellow of the American Society of Mechanical Engineers, highest grade of membership granted by the national society. King has been with TGT since 1946. He was chief engineer and vice president before being named senior vice president in 1958. He also is a director of Petro-Tex Chemical Corp.

Thornton F. Bradshaw, vice president and a director of Atlantic Refining Co., has been elected a director of Atlas Powder Co.

Paul N. Heald has been appointed manager, manufacturing operations, for Shell Oil Co. of Canada, Ltd.

Dr. George T. Kokotailo has been promoted to research associate in the research department of Socony Mobil Oil Co.'s Paulsboro, N. J., laboratory.

Five managers have been appointed by Texaco Inc. in a reorganization of the research and technical department. They are: **Dr. W. J. Coppoc,** manager, planning and information; **John K. McKinley,** commercial development processes; **W. A. McMillan,** technical services; **Dr. Richard L. Sawyer,** administrative services; and **Russell W. Hall,** Houston manager and coordinator of refining department activities. Coppoc, McKinley, McMillan, and Sawyer will headquarter in Beacon, N. Y., Hall, in Houston. Managers of Texaco's three largest research laboratories will report to **Dr. W. E. Kuhn,** general manager. They are **Dr. Robert E. Conary,** Beacon; **Dr. Gerhard Herzog,** Bellaire, Tex.; and **H. D. Massin,** Port Arthur-Port Neches, Tex. **Dubois Eastman** will head the Montebello, Calif., research laboratory.

H. C. Teasdel, retired chairman of The California Co., and **Glenn Forgan,** vice president of First National Bank of Chicago in charge of the oil division, have been elected directors of General Gas Corp., Baton Rouge, La.

Otto Grosz has been named corrosion engineer for The California Co. in New Orleans. **John C. Law,** area construction engineer in the West Delta area, has been named assistant district construction engineer for the South Louisiana production division in Harvey, La. **W. E. McClung** will succeed Law. **L. C. Orchard** has been named senior mechanical engineer in New Orleans.

Frederic B. (Fritz) Loomis has been named chief geologist in Clark Oil & Refining Corp.'s Denver exploration and production division. Loomis was with Shell Oil Co. and had done consulting work before joining Clark.

FERRIS

R. L. Ferris, chief exploitation engineer in Shell Oil Co.'s Midland, Tex., area, has been appointed chief exploitation engineer in the Houston area. He succeeds **C. V. Cameron,** who has been named head of a new systems-engineering group in Houston. Ferris had been division exploitation engineer in Oklahoma City and New Orleans and senior exploitation engineer in Tulsa before his Midland appointment in 1958.

Lester T. Potter, president of Lone Star Gas Co., Dallas, has been nominated for president of American Gas Association. He is now vice president of the association. Elections will be held October 12 during the AGA annual meeting in Atlantic City.

J. Q. Cope, vice president of California Research Corp., has been elected a vice president of California Chemical Co. He will be responsible for acquisition and construction of new facilities, both wholly and jointly owned. California Research and California Chemical are subsidiaries of Standard Oil Co. of California. Cope has been with the California Standard companies since 1931.

P. A. Dennie, production manager of Shell Oil Co.'s Roswell, N. M., division, has been named assistant to the vice president of the Pacific Coast area. He succeeds **J. T. Doyle,** recently named manager of the gas utilization department in New York. Dennie had held the Roswell post since 1958.

W. L. Gee, geologist with Shell Oil Co. in Houston, has been named paleontologist. **G. M. Harwell, Jr.,** junior geologist, has been promoted to geologist in Corpus Christi, Tex. Also, **F. T. Leder,** junior mechanical engineer, has been named gas engineer in Houston. **J. N. McCrary,** junior mechanical engineer, has been promoted to mechanical engineer, Houston.

William Edward Dickson has been named geophysical supervisor in Madrid, Spain, for Geophysical Service Inc. He will be in charge of operations for GSI exploration field parties in the Spanish Sahara. Dickson had been in GSI's London office. **Lewis Sole,** seismic party chief, has been named administrator for GSI field parties in the Eastern Hemisphere and Latin America.

▶▶▶ Deaths

Frank M. Zimmerman, 74, a director of Consolidated Royalty Oil Co., Casper, Wyo., died June 27 in Douglas, Wyo.

Howard F. Gunter, 72, Houston independent operator, died July 4 in a Houston hospital.

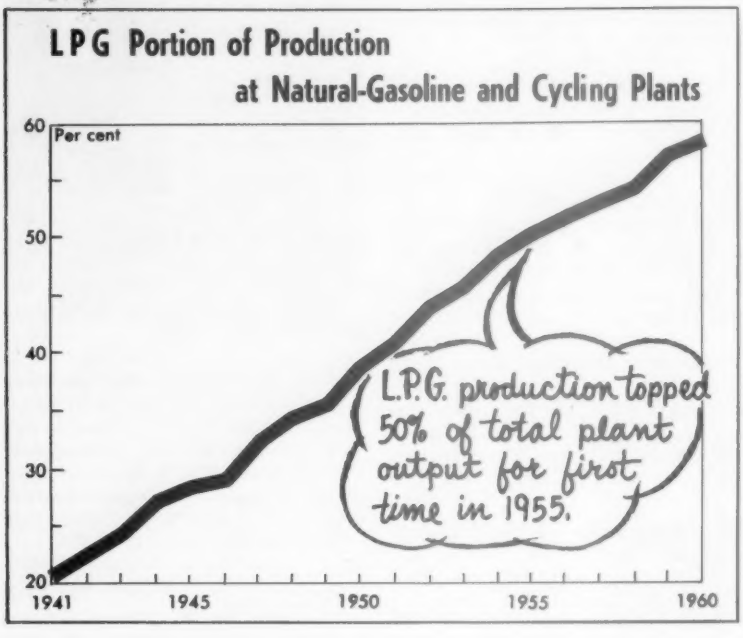
Harold H. Duck, 60, Tulsa independent producer, died July 4 in a Tulsa hospital of cancer after a 6-month illness. Duck had been in the oil business since 1937.

David T. Shaw, 66, retired manager of Atlantic Refining Co.'s Philadelphia refinery, died July 1 in a suburban Philadelphia hospital. Shaw joined Atlantic in 1929 and was named manager of the Philadelphia refinery in 1952. He retired two years ago.

W. L. (Luke) Hunter, 67, retired northern region manager with Hughes Tool Co., died July 4 in Ardmore, Okla., of injuries suffered in an auto accident. Hunter retired 3 months ago after 31 years with Hughes.

Jess Ray Wilkins, 59, of Power Rig Drilling Co., died June 21 in Lafayette, La., after a heart attack. Wilkins entered the oil business in 1918 with Willis, Trigg & Lewis. He later worked for Tom Slick, Sr., Slick-Urschell, Hewgley Drilling Co., and others.

Franklin V. Long, 60, founder and president of Vapor Recovery Systems Co., Compton, Calif., equipment firm, died June 27 at his home in Whittier, Calif.



Supplying LPG is a year-round job

BY JOHN C. CASPER

LIQUEFIED PETROLEUM GAS from natural-gasoline and cycling plants has become an important energy source for our modern economy. It has been one of the fastest-growing energy sources over the past 20 years.

Last year, LPG accounted for 5.6% of total petroleum supply in this country. Prior to 1941, plant production of LPG was so low that it was not even reported as a separate item by the Bureau of Mines.

The importance of this supply item is also shown by the increasing attention given it by plant operators. The chart shows the portion of total natural-gasoline and cycling plant production represented by LPG since 1941.

Note that LPG production accounted for less than 21% of total production at plants in 1941. Plant operators treated 2.76 trillion cubic feet of gas. They recovered only 0.255 gal. of LPG per thousand feet treated. Most of this liquid was either butane or isobutane.

The chart shows a steady growth in production of LPG as a per cent of total plant output. Note that LPG production had climbed to better than a third of total plant output by 1947. It crossed the 50% mark in 1955.

The Bureau of Mines report for 1959 shows LPG production at 58.5% of the total, and trends so far this year indicate about 59.1% for 1960.

One of the big headaches in production and distribution of LPG has been the problem of storage. Aboveground steel storage is expensive. Overland transportation in pressure cars is also expensive. Suppliers needed cheap storage near or in the areas of winter consumption.

For many years, suppliers promoted increased storage capacity at the jobber level. Growth in distribution storage was slow because pressure tanks were expensive. However, suppliers reported some degree of success as steel became available after World War II.

Underground storage came first in the salt-layer areas of the Southwest. The more recent development of mined caverns has made it possible to expand primary storage in the consuming areas of the country.

There is some evidence that distributors and jobbers are turning the seasonal storage problem back to the supplier. He may be forced to continue the expansion of underground storage in the distribution areas.

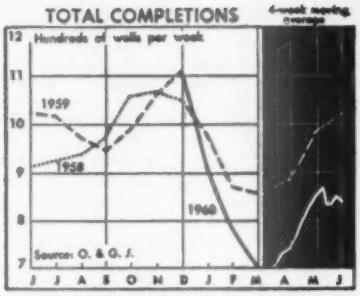
These increases in underground storage have made it possible for the operator to run his plant at near capacity during the summer months without flaring or venting light products. But since he has taken on the job of supplying seasonal storage he will have to continue his search for places to mine cavities near distribution points.

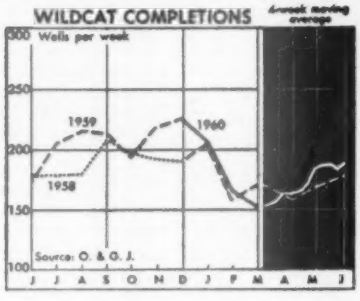
Plant operators produced 48.2% of the 1959 LPG during the summer months. They were able to produce only 44.9% of the 1949 total during the summer.

LPG production and distribution is getting to be a full 12-month job with no time off in the summer season.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,802,000	DOWN	10,000	DOWN	105,000
Crude stocks	257,658,000	DOWN	1,299,000	DOWN	12,712,000
Completions	809	DOWN	107	DOWN	388
Refinery runs	8,295,000	UP	64,000	UP	359,000
Gasoline stocks	201,716,000	DOWN	1,526,000	UP	6,727,000
Kerosine stocks	27,549,000	DOWN	34,000	UP	20,000
Distillate stocks	111,722,000	UP	4,835,000	DOWN	9,457,000
Residual stocks	41,239,000	UP	647,000	DOWN	13,166,000
Four-product stocks	382,226,000	UP	3,922,000	DOWN	15,876,000
Total imports	1,489,900	DOWN	136,200	DOWN	500,900





Active Rotary Rigs

	7-4-60	6-27-60	7-6-59
Alabama	4	4	9
Alaska	4	4	(†)
Arkansas	12	14	12
Arizona	0	1	2
California	81	87	101
Land	76	81	96
Offshore	5	6	5
Colorado	27	29	46
Florida	2	2	2
Land	0	2	1
Offshore	2	0	1
Illinois	42	39	36
Indiana	8	9	11
Iowa	0	0	2
Kansas	103	120	158
Kentucky	4	4	10
Louisiana	287	295	381
North	41	36	43
S. Inland waters	113	110	160
S. Land	81	93	125
Offshore	52	56	53
Maryland	1	0	0
Michigan	36	44	27
Mississippi	55	58	77
Missouri	1	2	1
Montana	27	17	24
Nebraska	32	28	36
Nevada	0	0	1
New Mexico	108	114	128
New York	0	0	1
North Dakota	15	16	20
Ohio	6	6	4
Oklahoma	174	192	243
Pennsylvania	11	13	10
South Dakota	0	0	2
Tennessee	0	0	1
Texas	569	574	768
S. Inland waters	5	4	5
S. Land	161	168	194
Offshore	2	1	0
North	51	55	162
Panhandle	42	41	(*)
East	46	56	(*)
West Central	166	156	254
West	96	93	153
Utah	35	29	35
Washington	0	0	1
West Virginia	4	5	9
Wyoming	69	65	90
Total U. S.	1,717	1,771	2,248
Western Canada	143	155	137
Eastern Canada	2	2	0
Grand total	1,862	1,928	2,385

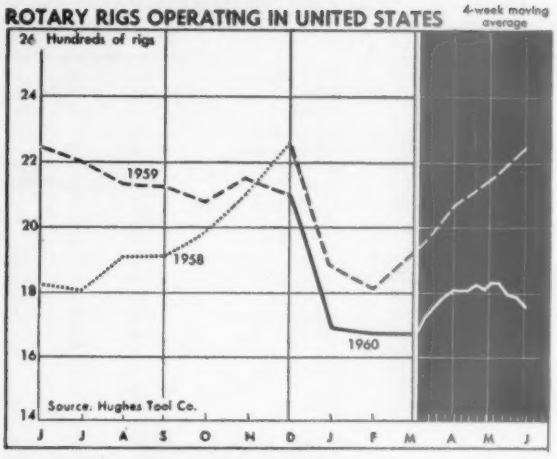
Hughes Tool Co. report. *Included in north. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 2, 1960

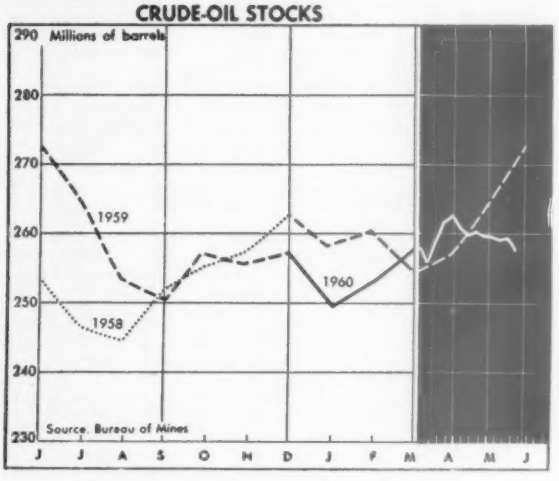
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	2	2	0	0	0	0	22,851	27	49	0	0	0	0	0	1	10
Arizona	0	0	0	0	0	0	0	8	.....	0	0	0	0	0	8	.....
Arkansas	9	3	0	0	6	0	34,415	302	416	3	0	0	0	3	79	68
California	20	19	0	0	1	0	96,000	710	767	0	0	0	0	0	137	176
Colorado	15	5	0	2	8	0	74,635	313	366	8	1	0	0	7	151	218
Illinois	29	9	0	0	20	0	58,403	992	1,048	4	0	0	0	4	225	167
Indiana	17	9	0	2	6	0	24,618	469	386	6	2	0	1	3	178	130
Kansas	62	26	0	3	32	1	225,189	1,650	1,986	19	1	0	0	18	539	443
Kentucky	21	7	0	1	13	0	31,016	783	1,273	1	0	0	1	0	91	75
Louisiana	86	32	6	5	43	0	692,473	1,718	1,780	19	1	0	0	18	268	224
North	41	10	0	4	27	0	201,192	595	642	13	1	0	0	12	125	93
South	34	16	3	1	14	0	375,507	855	944	5	0	0	0	5	125	124
Offshore	11	6	3	0	2	0	115,774	268	194	1	0	0	0	1	18	7
Michigan	11	4	0	0	7	0	35,011	372	310	0	0	0	0	0	108	73
Mississippi	8	1	1	0	6	0	83,334	362	320	5	1	0	0	4	129	150
Montana	8	0	0	0	8	0	37,420	147	148	5	0	0	0	5	69	53
Nebraska	15	3	0	0	12	0	84,219	399	412	8	0	0	0	8	158	180
New Mexico	43	17	0	9	16	1	178,957	931	955	12	1	0	1	10	142	116
West	11	2	0	8	1	0	45,673	300	428	1	0	0	0	1	29	35
East	32	15	0	1	15	1	133,284	631	527	11	1	0	1	9	113	81
New York	0	0	0	0	0	0	0	161	129	0	0	0	0	0	21	13
North Dakota	4	2	0	0	2	0	24,130	151	260	1	0	0	0	1	35	52
Ohio	9	2	0	7	0	0	28,001	502	491	0	0	0	0	0	27	14
Oklahoma	80	47	0	4	29	0	309,487	1,970	3,004	14	4	0	0	10	386	448
Pennsylvania	0	0	0	0	0	0	0	311	311	0	0	0	0	0	8	5
South Dakota	0	0	0	0	0	0	0	15	.....	0	0	0	0	0	6	.....
Texas	312	162	10	12	124	4	1,305,306	8,028	9,694	71	3	0	1	67	1,611	1,785
Dist. 1	24	9	0	0	15	0	45,798	548	582	12	0	0	0	12	206	162
Dist. 2	10	2	1	2	5	0	55,469	380	409	2	0	0	0	2	90	118
Dist. 3	28	13	1	0	14	0	175,187	620	575	6	0	0	0	6	117	119
Dist. 4	24	6	1	3	14	0	126,033	548	657	8	0	0	1	7	160	160
East	27	11	1	0	15	0	113,836	641	567	5	0	0	0	5	113	117
Dist. 7-B	39	18	0	0	20	1	128,747	1,155	1,346	13	1	0	0	12	328	357
West	86	56	3	0	26	1	420,747	2,144	3,013	14	0	0	0	14	332	371
Dist. 9	52	38	2	1	9	2	146,191	1,481	1,854	8	2	0	0	6	209	322
Dist. 10	22	9	1	6	6	0	93,298	511	691	3	0	0	0	3	36	59
Utah	2	2	0	0	0	0	15,368	132	172	1	1	0	0	0	45	48
West Virginia	6	0	0	6	0	0	12,000	362	370	0	0	0	0	0	4	10
Wyoming	28	18	0	0	10	0	142,701	509	454	6	1	0	0	5	210	154
Misc. (Mo.)	22	3	0	0	19	0	28,137	75	58	22	3	0	0	19	69	29
Total U. S.	809	373	17	51	362	6	3,543,671	21,399	25,159	205	19	0	4	182	4,705	4,641
Previous week	916	411	18	72	368	47	3,694,827	.....	.....	192	10	3	6	173	.....	.....
Cum. 1960	21,399	10,080	658	1,695	8,367	599	93,616,284	.....	.....	4,705	419	50	151	4,085	.....	.....
Cum. 1959	25,159	12,867	618	1,815	9,197	662	103,776,434	.....	.....	4,641	460	65	138	3,978	.....	.....
Western Canada	39	25	0	3	11	0	171,010	1,044	1,242	9	0	0	1	8	299	381

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	6-25-60	6-18-60	6-27-59
Pennsylvania	2,134	2,132	2,466
Other Appalachian	1,731	1,714	2,093
Illinois, Indiana, Michigan	10,152	10,367	9,582
Nebraska and North Dakota	2,911	2,716	2,996
Kansas	9,646	9,875	10,524
Oklahoma	18,513	18,543	16,942
Arkansas	2,017	1,870	1,954
Louisiana	19,471	19,296	19,461
North	3,271	2,905	3,146
South	16,200	16,391	16,315
Mississippi, Alabama, Florida	1,843	2,094	2,391
New Mexico	8,153	8,022	8,111
Texas	106,804	108,530	116,461
East Texas	8,534	8,591	9,277
West Texas	48,317	49,156	55,615
Texas Gulf	18,763	19,383	18,945
Other Texas	31,190	31,400	32,624
Wyoming	18,270	17,883	16,363
Other Rocky Mountain	10,225	10,263	9,537
California	28,912	28,773	32,862
Foreign	†16,876	16,879	18,627
Total	**257,658**	258,957	270,370

*Bureau of Mines. †Includes 4,546,000 bbl. in California.

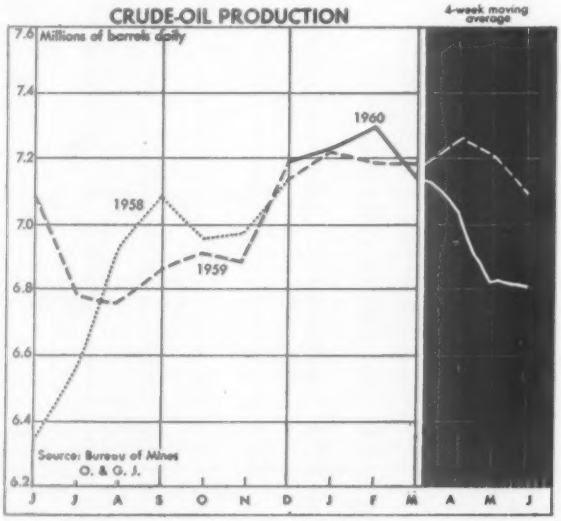
DAILY AVERAGE PRODUCTION FOR WEEK

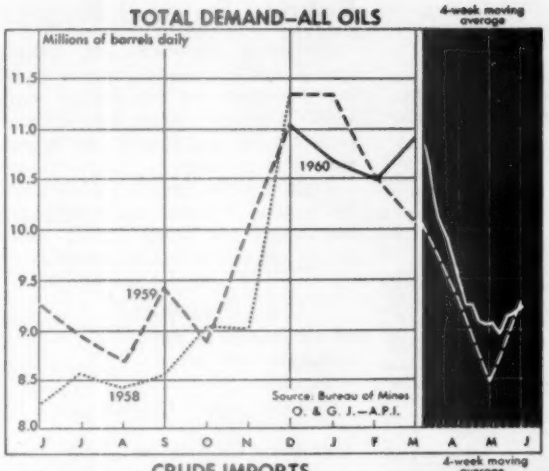
	July 2, 1960			June 25
	Crude oil	Lease condensate	Total	total
Alabama	17,725	.....	17,725	17,675
Arkansas	78,455	120	78,575	77,075
California	836,000	.....	836,000	833,800
Colorado	124,200	.....	124,200	125,400
Eastern	40,000	.....	40,000	38,900
Florida	1,000	.....	1,000	1,000
Illinois	210,400	.....	210,400	209,300
Indiana	32,400	.....	32,400	32,000
Kansas	†281,590	.....	†281,590	†289,210
Kentucky	63,300	.....	63,300	62,800
Louisiana	924,400	126,200	1,050,600	1,051,100
North	107,400	5,700	113,100	113,600
South	817,000	120,500	937,500	937,500
Michigan	40,500	.....	40,500	40,500
Mississippi	136,750	.....	136,750	136,750
Montana	77,600	.....	77,600	75,300
Nebraska	68,000	.....	68,000	65,200
Nevada	100	.....	100	100
New Mexico	288,500	.....	288,500	288,500
North Dakota	61,700	.....	61,700	60,600
Oklahoma	†493,200	.....	†493,200	†502,900
Texas	2,374,000	87,900	2,461,900	2,461,900
Dist. 1	42,000	3,000	45,000	45,000
Dist. 2	100,000	8,200	108,200	108,200
Dist. 3	314,000	37,000	351,000	351,000
Dist. 4	163,000	18,000	181,000	181,000
Dist. 5	26,000	350	26,350	26,350
Dist. 6	102,000	9,000	111,000	111,000
East Texas field	123,000	.....	123,000	123,000
Dist. 7-B	126,000	150	126,150	126,150
Dist. 7-C	117,000	2,825	119,825	119,825
Dist. 8	958,000	6,500	964,500	964,500
Dist. 9	196,000	1,900	197,900	197,900
Dist. 10	107,000	975	107,975	107,975
Utah	101,400	.....	101,400	104,200
Wyoming	335,000	.....	335,000	336,100
Others	‡1,200	.....	‡1,200	‡1,250
Total U. S.	6,587,420	214,220	**6,801,640**	6,811,560
Change from prev. week, down			**9,920**	.....
Canada	.....	.....	.....	†557,200

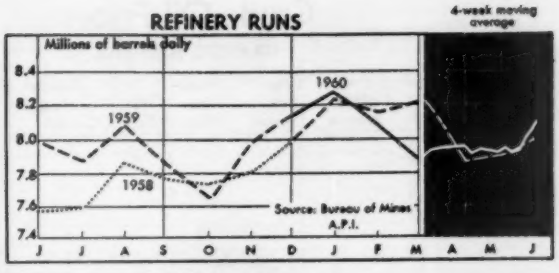
Total U. S. production, January 1-July 2 ..... 1,294,784,300 bbl.
Same period last year (crude plus cond.) ..... *1,315,888,200 bbl.

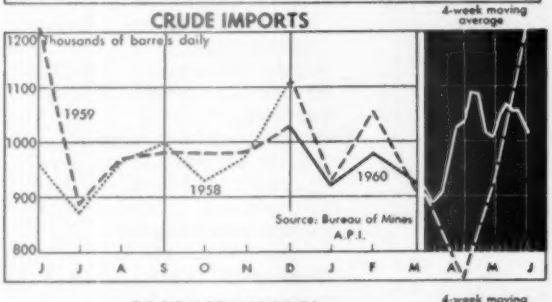
*Includes 34,896,300 bbl. condensate. †Week ended previous Monday. ‡Alaska and South Dakota.

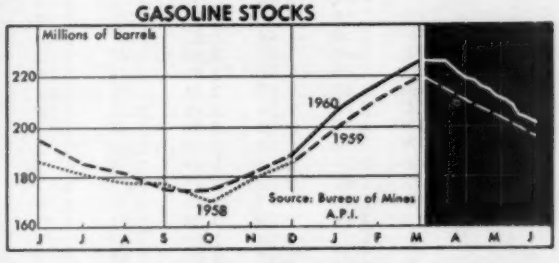
CRUDE-OIL PRODUCTION

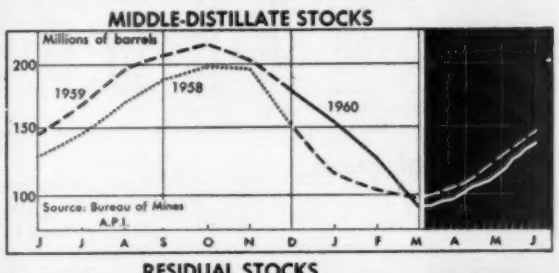


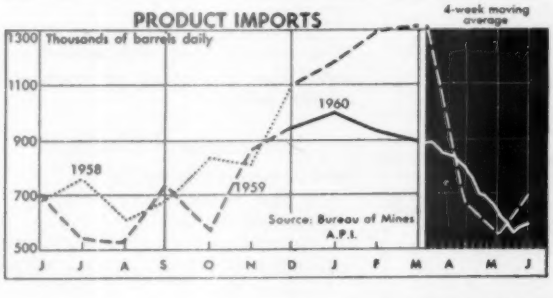


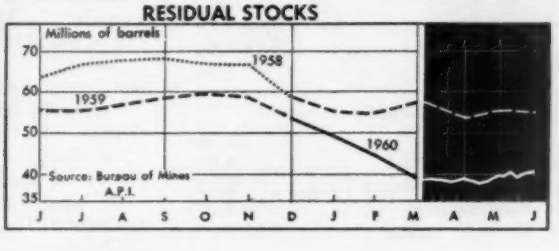












API REFINERY REPORT—JULY 1, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1959 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,123	546.1	36.1	314.7	162.6	45,577	10,819	39,810	11,898	1,101	522.0	13.3	325.6	160.0
Appalachian:														
District 1	100	41.4	2.4	22.3	8.0	6,132	641	2,469	396	92	40.8	3.0	21.5	4.2
District 2	107	56.3	1.0	20.4	11.4	2,836	331	1,111	272	107	59.5	1.1	20.5	8.3
Ind., Ill., Ky.	1,512	795.7	81.4	320.0	134.4	35,778	5,356	19,521	4,837	1,413	737.5	68.5	282.6	119.8
Minn., Wis., Dak.	126	62.9	3.9	31.1	19.3	7,090	1,155	4,879	624	115	55.5	7.7	26.5	11.1
Okla., Kans., Mo.	752	393.4	15.4	184.7	26.7	17,888	1,328	9,625	1,077	709	386.8	11.5	166.3	18.5
Inland Texas	321	241.7	12.4	54.1	22.1	6,644	557	1,597	2,489	294	229.6	6.6	49.3	24.8
Tex. Gulf Coast	2,006	1,045.4	119.1	501.9	142.6	25,635	3,052	11,520	4,403	1,737	914.2	56.5	405.9	127.8
La. Gulf Coast	685	354.1	47.1	155.3	49.3	10,841	1,722	5,130	1,285	712	395.2	47.2	166.2	44.7
N. La. and Ark.	109	67.3	4.0	24.0	5.0	5,661	747	2,203	136	69	28.5	1.8	14.0	4.2
Rocky Mountain:														
New Mexico	25	15.0	0.7	4.9	1.9	686	43	148	11	27	13.8	0.5	5.2	2.3
Other Rky. Mt.	306	137.7	5.9	71.0	34.0	6,220	298	2,232	890	327	144.8	3.1	67.3	35.1
West Coast	1,123	518.6	35.9	146.9	238.1	30,728	1,500	11,477	12,921	1,178	547.7	3.9	167.8	262.1
July 1, 1960	8,295	4,275.6	365.3	1,851.3	855.4	201,716	27,549	111,722	41,239	7,881	4,075.9	224.7	1,718.7	822.9
June 24, 1960	8,231	4,150.7	317.6	1,812.6	872.3	203,242	27,583	106,887	40,592	.....	.....	.....	.....	.....
July 3, 1959	7,936	3,914.6	255.4	1,824.0	954.6	194,989	27,529	121,179	54,405	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.76	....	....	....	....	....	....	....	....
15-15.9	1.84	....	....	....	....	....	....	....	$1.81
16-16.9	1.92	....	....	....	....	....	....	....	1.86
17-17.9	2.00	....	....	....	....	....	....	....	1.91
18-18.9	2.08	....	....	....	....	....	....	....	1.96
19-19.9	2.16	....	....	....	....	....	....	....	2.01
20-20.9	2.24	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.32	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.39	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:
- Sweet Lake $3.00

Texas:
- East Texas 3.05-3.25
- Conroe 3.23-3.53
- Van 3.08

Pennsylvania Grade:
- Bradford $4.70
- Middle District 4.52
- Southwest Pennsylvania ... 4.25
- West Virginia 4.07
- ★ Buckeye Grade 3.98-4.07

Illinois Basin **2.85-3.00**

Foreign

Middle East, Persian Gulf (cargoes f.o.b. lifting port):
- Arabian, about 34°, Ras Tanura $1.90
- Iranian, 34.0°-34.9°, Bandar Masur 1.86
- Iranian, 34.0°-34.9°, Abadan 1.81
- Iraq, 36.0°-36.9°, Fao 1.82
- Kuwait, 31.0°-31.9°, Mina-al-Ahmadi 1.67
- Qatar, about 41°, Um Said. 2.05

Middle East, E. Mediterranean:
- Arabian, about 35°, Sidon.. 2.29
- Iraq, about 35°, Tripoli, Banias (Grade A) 2.29

Far East (cargoes, f.o.b. Lutong, Sarawak):
- Seria Light, 37° 2.57

Canada:
- Leduc-Woodbend $2.53
- Redwater (Alta.) 2.42
- Smiley (Sask.) 2.18
- Pembina 2.38

Venezuela:
- Cumarebo, 47°-47.9°, Tucupido 3.34
- San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
- Oficina, 35°-35.9°, Puerto La Cruz 2.80
- Tia Juana medium, 26°-26.9°, Amuay* 2.30
- Quiriquire, 16.0°-16.4°, Caripito 2.10
- Lagunillas heavy, flat, Las Piedras* 2.10
- Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)
- ★ Gulf-NY, dirty (ATRS—40.0%) $1.71
- PG-Japan, dirty (USMC—75.0%) 2.55
- ★ PG-NY, dirty (USMC—70.0%) 3.81
- ★ Carib.-UK, clean (Scale—45.0%) (17s. 11d.) 2.52

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):
- ★ Regular (91 octane).. 12.00
- ★ Premium (99 octane). 14.75
- Natural gasoline (26-70) 4.5
- Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
- Regular (90 octane) .. 10.25-10.50
- Regular (92 octane) .. 10.50-10.75
- Premium (98 octane).. 11.50-11.75

California (rack) Los Angeles:
- Regular (88 octane) .. 11.65-12.15
- Premium (94 octane). 12.65-13.15
- Premium (100 octane) 14.00-14.65

Caribbean area (cargoes):
- Regular (87 octane) .. 10.00
- Premium (97 octane).. 11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):
- Kerosine 42-44 ..... 9.25-9.375
- Diesel oil (58 d.i. and above) 8.875-9.00
- Distillate No. 1 ..... 8.875-9.00
- Distillate No. 2 ..... 7.875-8.00

Gulf Coast (cargoes):
- Kerosine 41-43 ..... 9.00
- Distillate No. 2 ..... 8.125

New York Harbor (barges):
- Kerosine 41-43 ..... 10.05
- Distillate No. 2 ..... 9.05
- Diesel fuel, 48-52 d.i. 9.35

Caribbean area (cargoes):
- Distillate No. 2 ..... 8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):
- Residual fuel (max. 1% S) $1.90

Gulf Coast (cargoes):
- Bunker C fuel 2.20-2.25

New York Harbor (barges):
- Bunker C fuel $2.47

Caribbean (cargoes):
- Bunker C $2.10

California (rack):
- Bunker C fuel, Los Angeles $2.15

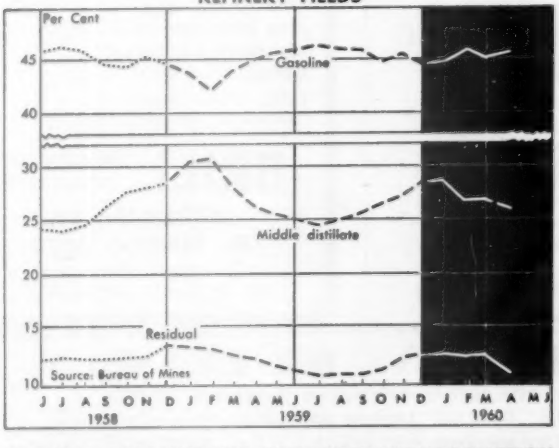
★Denotes change from previous week.

SUPPLY AND DEMAND—MAJOR PRODUCTS
(Thousands of barrels daily)

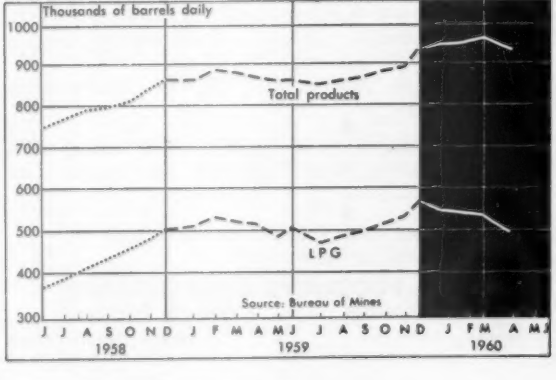
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
June 1960*	4,550	4,190	201,700
May 1960*	4,350	3,990	210,400
April 1960	4,357	4,115	216,100
July 1959	4,490	4,129	185,294
June 1959	4,371	4,153	196,078
KEROSINE			
June 1960*	270	356	27,500
May 1960*	185	325	24,900
April 1960	257	325	20,547
July 1959	197	225	28,328
June 1959	149	244	27,364
DISTILLATE			
June 1960*	1,290	1,805	111,700
May 1960*	1,330	1,720	94,900
April 1960	1,539	1,743	81,755
July 1959	1,131	1,719	140,388
June 1959	1,214	1,792	120,962
RESIDUAL			
June 1960*	1,280	855	41,200
May 1960*	1,400	870	39,800
April 1960	1,584	880	39,285
July 1959	1,232	823	54,509
June 1959	1,385	915	55,479

*Preliminary. †Thousands of barrels.

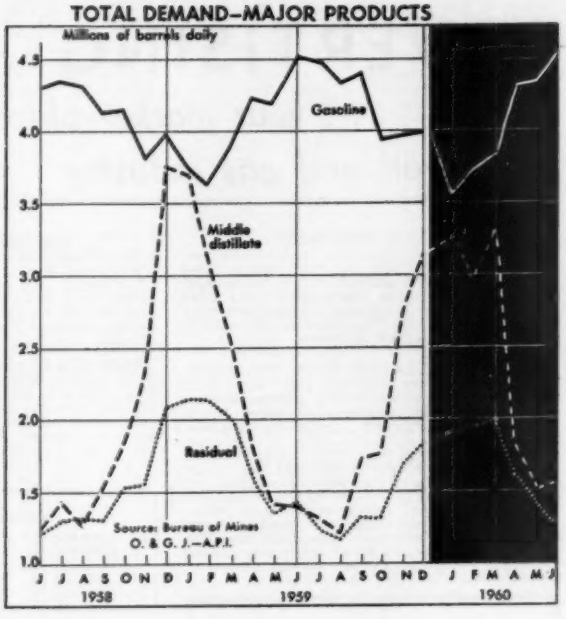
REFINERY YIELDS



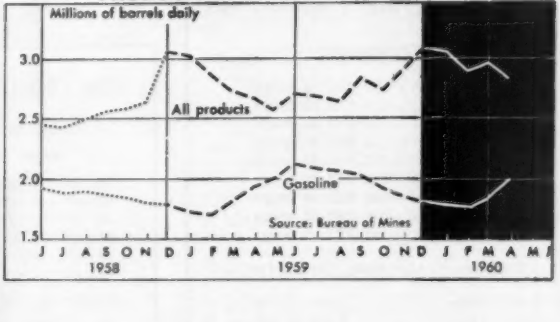
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



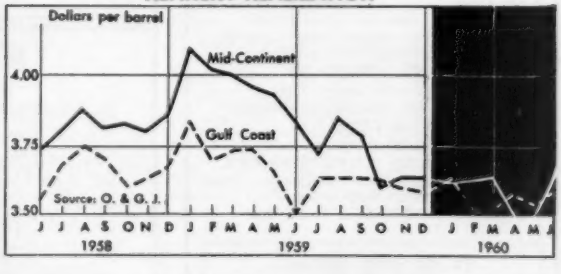
TOTAL DEMAND–MAJOR PRODUCTS



PRODUCTS DELIVERED BY PIPELINE



REFINERY REALIZATION



REFINERY REALIZATION

	June*	May*	April	March
Mid-Continent	$3.70	$3.44	$3.53	$3.60
Gulf Coast	3.60	3.54	3.58	3.58

*Preliminary. Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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at ESSO REFINERY Balto., Md.

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10' x 145'—125 PSI 50 trays
9'6" x 121'—325 PSI 30 trays
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7'0" x 82'— 75 PSI 30 trays
6'0" x 80'—300 PSI 30 trays
4'0" x 44'—150 PSI 12 trays
3'6" x 36'—400 PSI 12 trays
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BLOWERS—11,880 CFM @ 11 PSIG
INSTRUMENTS—Controllers, Recorders, Indicating and Transmitting
MOTORS—10 HP to 500 HP XP
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REACTOR—8' x 32'6" OA
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1.9 MILLION BTU NEW 1949

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2,000,000 ft.	2"	3.50# to the ft.
1,000,000 ft.	3"	7.70#
1,000,000 ft.	4"	10.98#
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1—1958 FAILING, special model 1500 rotary drill, only cut 2,000 feet of hole. Machine equipped with 2⅞" H. D. retracting rotary drill head, with 20" hydraulic stroke feed, Gardner-Denver 5 x 8 mud pump powered by separate IHC U-450 gas engine, 42' tubular steel mast, model Q-54-A P. T. O. friction clutch sand reel assembly with double brake bands, double brakes on hoisting drum, automatic pull-down assembly, heavy duty mast platform and rod rack, 8⅝" opening H. D. power break-out table, hydraulic breakout cylinder, tong-lines and counter-weights, S-1050-AH. D. bail-type water swivel, 2⅞" x 26', 6" round fluted Kelly, 50 Joints 2⅞" x 20 drill pipe mounted on International 172 tandem truck, actual mileage 1,387 and misc. extra tools. Cost new $36,000. Priced for quick cash sale at $21,500. For further details write or phone Union Pipe & Supply Company, Owensboro, Ky.

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140,000 lbs. of 1", 1⅛", 1¼" manila rope at 30% to 50% below distributor cost. Also nylon and sisal. Write for samples and quantity prices.

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Single hull slotted drilling barge, 185' x 38' x 12', with derrick substructure, reserve mud tanks, slush sand settling pits, deck fuel and water tanks, tool house and change locker house. Built 1950. Barge has Deckard all-galvanized derrick flood windbreak for 136' Emsco 18 ARH-1 derrick; rig and mud line manifold and associated equipment; Mid-Continent engine substructure, 3 sections, each 19'4" long x 7'4" high x 7' wide; Mid-Continent engine house, 36'6" long x 19'4" wide, and shed-type roof.

Barge is docked at Humble's slip on the Harvey, Louisiana canal and is offered for sale on an as-is, where-is basis. Inspect by contacting Mr. W. O. Foster at Humble's office on the Intracoastal Canal at Harvey.

Bids must be mailed to Westbrook Teer, Humble Oil & Refining Company, P. O. Box 2180, Houston 1, Texas. Bids must be received prior to 9:00 AM, September 1, 1960. Humble reserves the right to reject any and all bids.

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FOR SALE EQUIPMENT

FOR SALE on bid basis—one operating gas plant and pipe line system, Magnolia, Arkansas, daily capacity approx. 23 MMCF, 90,000 gallons. Contact Shell Oil Company, Mr. O. H. Hanyka, Magnolia, or H. B. Grist, Express 1331, New Orleans, Louisiana.

PLATFORM TYPE power drilling rig, 14,000 ft. capacity for sale on a bid basis at Morgan City, Louisiana. Rig unitized for quick move. Contact Shell Oil Company, W. L. Brady at Morgan City, or H. B. Grist, Express 1331, New Orleans, Louisiana.

25,000 feet 16" O.D. and 25,000 feet 20" O.D. ¼" wall pipe. API 5L grade B black steel line pipe, electric weld, 60,000 pound minimum tensile strength, plain end beveled for welding, double random lengths, uncoated. Pipe purchased from Republic Steel Co. and Youngstown Sheet and Tube Co. in May 1958. Facilities for coating pipe at storage yard.

Write: Box L-904
The Oil and Gas Journal,
P. O. Box 1260, Tulsa, Oklahoma

EQUIPMENT WANTED

WE ARE interested in the purchase of your depleted wells for salvage. Also, used casing, tubing, units, tanks, etc. Must be in Kansas area. The Buckeye Supply Company of Kansas, Inc., 105 S. Main, El Dorado, Kansas.

127 FT. Lee C. Moore Jackknife Derrick. 7' or 8' Substructure for 3 engine compound. Box L-891, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

FOREIGN EMPLOYMENT—foreign drilling superintendents, workover tool-pushers, cable tool drillers, rig mechanics. Also, refinery personnel, administrative and supervisory. Key Employment, 711 Main, Houston, CApitol 5-0727.

TECHNICAL SERVICE: Large independent oil company in Oklahoma City has opening requiring 5 years experience in testing and use of petroleum products. BS in Ch. E., Chemistry or M.E. Knowledge of manufacturing and marketing problems of oil industry helpful. Will write specifications and sales literature and give technical assistance to sales department. Salary commensurate with experience and ability. Box L-905, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED REFINERY instrument man, or helper, familiar with Foxboro pneumatic and large case electronics. For work in modern integrated refinery. Salary $2.72 per hour, plus time and one-half and double time. Send resume of experience to Personnel Director, Delta Refining Company, P. O. Box 3097, Memphis, Tennessee.

PETROLEUM ENGINEER—with production experience and sales ability, wanted by Houston Production Equipment Manufacturer. Box L-892, The Oil and Gas Journal, Tulsa 1, Oklahoma.

SALESMAN for line of automated chemicals and maintenance detergents for the oil and gas industry. Sales training. Position open about July 25. Write Chemicals, P. O. Box 341, Dallas 21, Tex.

NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, butane and pipeline companies. Nationwide, $5.00 cash. OIML Co., Box 2603, Tulsa, Oklahoma.

DRILLING ENGINEER

Good knowledge of modern drilling techniques and equipment essential. Work in Tulsa office of major contractor, but spend considerable time in field. Give complete summary of qualifications, age, and salary requirements in reply.

Box L-901
The Oil and Gas Journal

SITUATIONS WANTED

PETROLEUM ENGINEER—12 years diversified experience drilling and production, Texas and Louisiana Gulf Coast. Licensed Texas and Louisiana. Married, age 41, resume available. Box L-896, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRICAL ENGINEER 34, B.S., 7 years with Latin American Major, varied electrical, control, and construction background. Desires position, foreign or domestic, with future potential. P. O. Box 313, Ft. Collins, Colorado.

PETROLEUM PRODUCTION Engineer, BS, Okla. U., 30, married, six years diversified major company experience. Excellent references. Box L-898, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, B. S. University of Texas. 10 years major and independent experience. Subsurface and completion in Julesberg, Willston, Mid-Continent, two years recently in Kentucky. Age 35. Will relocate. Box L-899, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—Age 29. Total 5 years drilling, production and reservoir experience; 1½ years in South Amrica. Desires foreign employment. Box L-721, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 30; seven years diversified experience oil and gas drilling, production, workovers, reservoir analysis, evaluations, and log analysis. Desires challenging opportunity with aggressive company or consultant. Box L-903, The Oil and Gas Journal, Tulsa, Oklahoma.

SENIOR EXECUTIVE

Prive corp., 38, married, LLB, seeks position with aggressive independent oil company desiring overseas expansion. Exp. negotiations, concession agreements, business practices Europe, Africa, Middle East. Have knowledge of areas available, some with local financial participation. Personal resume on request.

Box L-900, The Oil and Gas Journal, Tulsa, Okla.

GEOLOGIST-PALEONTOLOGIST

B.S. degree in Geology, 20 years major and independent oil company experience in geology in the U. S. Mid-Continent, California, South America, and the Middle East, familiar with micropaleostratigraphy, depositional environments, well correlations by lithology, foraminifera, ostracods, pollen and spores, residues, all types of well logs, geologic and magnetic surveys, ideas for drilling wells, wants retainer.

216 Knox Building Enid, Oklahoma

LEASE AND DRILLING BLOCKS

PICKETT COUNTY, Tennessee—100 acre adjoining Knox Sand production price $15.00, with ⅛ override block 720 acres price $5.50 with ⅛ override. We have drilling blocks and farmouts. Come inspect. Wire, phone Cravens & Thomas, Parkway Hotel Bldg., Burkesville, Kentucky.

3,500 ACRES $2 per acre. Lawrence County, Ky. in midst of new gas play. Ten year leases in first year, ⅛ override, no drilling committment, 50 cents per acre annual rental. U. S. Andersen, 8350 Santa Monica Blvd., LA 46.

PROSPECTIVE OIL Land: Suitable townsite acreage in fee. E/35 acres, Sec. 16, Block JKL, PSL Survey, Hudspeth County, Texas, at intersection U. S. Highway 62 and F. M. 1437 Highway, south of Dell City, Texas. Write quickly, Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

PROVEN GAS RESERVES

Newly discovered gas field. Market nearby, suitable for storage. Interested purchasers may write for complete information. Box L-887, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

BOTTOM HOLE pay offset and close-in acreage to J Sand test 6800' 22-3N-61W Denver Basin. G. N. Babcock, Chanute, Kansas. Phone 1531.

FOR ASSIGNMENT 590 acres Ohio County, Ky. Two miles north of Hartford. Bordered on two sides by definite faults. A. J. B. Oil and Exploration Co., P. O. Box 1121, Harlingen, Texas.

EASTERN KANSAS proven Bartlesville production 740 ft. deep, 8 inside locations, 4/8 working interest for sale. $500.00 per 1/8 to drill No. 1. For details write: Box L-882, The Oil and Gas Journal, Tulsa, Oklahoma.

HAVE 300 acres royalty for sale Ellis County Oklahoma in area which has good geology. Fletcher Bowles, Box 812, Oklahoma City. Phone CE 6-5405.

HAVE SEVERAL lease blocks South Georgia on Gravity Survey Highs. Want Drilling Deals with financially interested people or owner of portable slim hole rotary rig. You furnish rig, I'll furnish labor, material. Ready to go. Oil and Gas seepage on area. T. R. Davis, 601 Jackson St., Vidalia, Georgia.

HAVE approved acreage in Ohio to farm out. David Law—Phone HU 5-6446, 716 Union Trust Building, Parkersburg, West Virginia.

759 ACRES ALLEN and Monroe Counties, Kentucky, available for sublease, assignment or drilling contract. Phone 6572, or write: Box 697, Oil City, Louisiana.

4,200 ACRE drilling block. Shallow sands under 600'. Sell $1.50 acre outright or make drilling deal on all or portion. Good Geology. PEDCO, 2900 East Elm, Wichita, Kansas, Ph MU 2-4814.

EASTERN KANSAS. Have good shallow production areas ready to drill. Ideal tax projects. Habiger Drilling, Lawrence, Kansas. Phone VI-3-8553 evening.

DRILLING DEALS available Cambridge arch area of Nebraska. All based on subsurface geology. 10 to 12 possible pays. Economics excellent. Major company support on many. William V. Wade, Consulting Geologist, Box 772, McCook, Nebraska.

FOR SALE—working interest in 160 acres offset to nice Bartlesville Sand, well 750 ft. Eastern Kansas. Box L-902, The Oil and Gas Journal, Tulsa, Oklahoma.

KENTUCKY—4,000 acres Pulaski County, $1.00 cash per acre, $1.00 oil payment per acre from ⅛. 10 year term leases 25 cent rental paid to January 1961. Assign all or any part. Investigate today. Write, wire, phone: W. V. Cravens, Russell Springs, Kentucky.

MONEY RAISING

HELP NEEDED—to finance drilling blocks. Information furnished on request. J. S. Lewis, 208 S. Bolton Street, Jacksonville, Texas.

FINANCING

CAPITAL needed to drill offset production in West Virginia oil bringing 4.07 at well. Gas—.25c per thousand, in West Virginia, big play. David W. Law. Phone: HU 5-6446, 716 Union Trust Building, Parkersburg, West Virginia.

ROYALTIES

PRODUCING LAND Owners royalty for sale. 10 acres paying $27. month. Settled, under 160, 5,000 ft., major company. 3 more locations. $250.00 acre. Jimmy Nix, Box 3041, Oklahoma City, Okla.

WANT LISTINGS of producing royalties and non-producing royalties. Give full information. R. E. Clement, Box 65, Norman, Oklahoma.

FOR SALE: Oil and Gas Royalty under 500 acres in Scipio Oil field, Jackson Co., Michigan. Non producing offsets flowing, drilling on property soon. Also a farmout in trend. Donald Davis, Phone VI 9-9118, Jonesville, Michigan or Phone 972-2, Bluffton, Indiana.

REAL ESTATE

MEXICAN RANCHES—Two 20,000 acre ranches west of Saltillo, Coahuila State, about 150 miles from border. Good title, $3.50 per acre, suitable for cattle or recreation. Box L-895, The Oil and Gas Journal, Tulsa, Oklahoma.

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(Continued from page 159)

anticlines, salt domes and other oil-gathering features capable of providing reservoirs of prolific production.

One outstanding Arctic geological authority puts the maximum thickness of these favorable sediments at 80,000 feet, and another eminent Arctic geologist who heads the exploration department of a Calgary-based company, estimates the possible recovery of crude oil in the region of the permits at 100 billion barrels.

Arkansas' Arkoma adds gas discovery

Northwestern Arkansas' side of the two-state Arkoma basin is adding to its steadily lengthening list of gas-producing areas with a new discovery by Arkansas Western Gas Co. just north of Altus, in Franklin County.

Discovery well, 1 H. Weiderkehr, is dually completed with production from three zones. Flow from the two upper zones, Basal Atoka, perforated at 4,875-95 ft., and Lower Cannon sand at 5,037-57 ft., is combined. Open-flow potential from these zones totals 1,500 M.c.f.d. Shut-in pressure is 1,311 psi.

Best flow is from the lowermost zone in Hale Stringer sand, perforated at 5,242-56 ft. Its open-flow potential is 13 M.M.c.f.d. Shut-in pressure is 2,001 psi.

The new area is 2 miles south of the old Ozark gas area, found in 1930. It is 5 miles southeast of the larger and more prominent White Oak field, opened in 1945.

Operators are stepping out a mile east for another 5,300-ft. Hale-sand test.

Discovery wells

NORTH LOUISIANA

Concordia Parish:

R. A. Stacy et al. 1 Madison Development Co., 9-5n-8e, 5 miles northwest of Deer Park. IPP 30 BOPD, 38°, perf. 4,700-7 ft., Wilcox-Quinn Bayou sand TD 4,737 ft. New-field discovery 1½ miles northwest of Quinn Bayou field.

DeSoto Parish:

D. B. McConnell 1 Asseff, 22-11n-12w, 2½ miles east of Oxford. IP 32 BOPD (net), 60 BWPD, 48/64-in., 45°, TP 30 psi., perf. 2,854-2,900 ft., Paluxy. TD 3,022 ft. New-field discovery 2½ miles south of Ten Mile Bayou field.

MISSISSIPPI

Rankin County:

Gulf Coast Drilling & Exploration, Inc. et al. 1 R. H. Allen et ux., 13-3n-5e. IP 264 BOPD, ¼-in., 38.8°, TP 300 psi., perf. 8,615-22 ft., Washita-Fredericksburg; and 580 M.c.f.d., 9 BCPD, 6/64-in., 58.7°, perf. 9,329-36 ft. and 9,418-26 ft., Paluxy. TD 12,366 ft. Paluxy zone shut in. Discovery well Puckett field.

NEBRASKA

Cheyenne County:

S. D. Johnson 1 Micek, C SE NE 17-15n-48w. IPP 200 BOPD, "D" sand discovery, new field. TD 4,606 ft. Opens Keno field.

NEW MEXICO

Lea County:

James P. Dunigan 1 Denius, 7 miles southeast of Maljamar in 33-17s-33e. IPF 502 BOPD, 22/64-in. choke, 38.6°, GOR 918:1, TP 510 psi., packer. Abo reef 8,710-53 ft. TD 8,950 ft. New oil discovery.

WEST CENTRAL TEXAS

Coleman County:

I. S. Dolen, Jr., 1 L. L. Baker, 5½ miles northeast of Santa Anna in Mary Ann Fisk Sur. 630. IPP 17 BOPD plus 30% water, 39°, GOR 600:1. Sand open hole at 1,368 ft. TD 1,377 ft.

Stephens County:

Three D Drilling Co. 1 M. W. Lockridge et al., ½ mile north of Caddo in Sec. 44, Block 5, T&P Sur. IPP 28 BOPD, plus 1% water, 42°, GOR 100:1. Top pay 2,670 ft. TD 3,004 ft.

Taylor County:

Dixon Drilling Co. 1 J. F. Olney, 2½ miles southwest of Moro, in Sec. 130, Blk. 64, H&TC Sur. IPP 45 BOPD, 41.2°, GOR 215:1, 2,806-18 ft. TD 3,082 ft.

WEST TEXAS

Borden County:

Trice Producing Co. 1 Bert Dennis, [illegible] miles northeast of Gail in Sec. 11, Blk. 30, T-5-N, T&P Sur. IPP 210 BOPD, 32°, GOR 200:1, Miss. 8,315-70 ft. TD 8,702 ft. New oil discovery.

El Cinco Production Co., Ltd., 1-C C. A. Atkins, 10 miles south of Imperial in Sec. 26, Blk. 10, H&GN Sur. IPF 434 BOPD, 16/64-in. choke, 39°, GOR 728:1. TP 600 psi., CP 800 psi. Montoya 5,202-62 ft. TD 7,664 ft. New oil discovery.

Kleberg County:

Mokeen Oil Co. 1 H. A. M. Fee Unit, Section 65, Kleberg Town & Improvement Co. Subd. Lot 26, 8 miles southeast of Ricardo. AOF 3,800 M.c.f.d., GLR 32.4 M.c.f. per bbl., 54.8°, shut-in TP 3,775 psi., perf. 8,158-78 ft., Plummer sand; AOF 9 M.M.c.f.d.. GLR 38.4 M.c.f. per bbl., 55.2°, shut-in 3,780 psi., perf. 8,276-86 ft., Deauveal sand; AOF 11 M.M.c.f.d., GLR 31.55 M.c.f. per bbl., 56.9°, shut-in 3,820 psi., perf. 8,311-21 ft., Jones sand. TD 9,515 ft. Discovery well of Heep field.

Nueces County:

Engeo Oil & Gas Co. 1 Barnhart, J. H. Smith Sur., 4 miles southwest of Clarkwood. AOF 10.5 M.c.f.d., dry gas, shut-in TP 1,166 psi., perf. 2,884-88 ft., Oakville. TD 5,007 ft. New reservoir discovery in Cody-Baldwin area.

Pecos County:

W. D. Comer 1-A J. L. Nutt, 22 miles southeast of Fort Stockton in Sec. 15, Blk. 125, T&STL Sur. IPCAOF 2,350 M.c.f.d., Queen sand 2,396-2,416, and 2,440-46 ft. TD 9,735 ft. PBTD 2,503 ft. New gas discovery.

San Patricio County:

Goldston Oil Corp. 1 J. E. Garrett, Section "P", George H. Paul Subd., Coleman-Fulton Pasture Co. Land, John Genraghty Sur., A-139, 2 miles southwest of Gregory. AOF 6 M.M.c.f.d., 125 BC per M.M.c.f., shut-in TP 5,900 psi., perf. 10,592-10,612 ft., Frio-McKamey sand. TD 11,035 ft. New-field discovery 2 miles east of Stark field.

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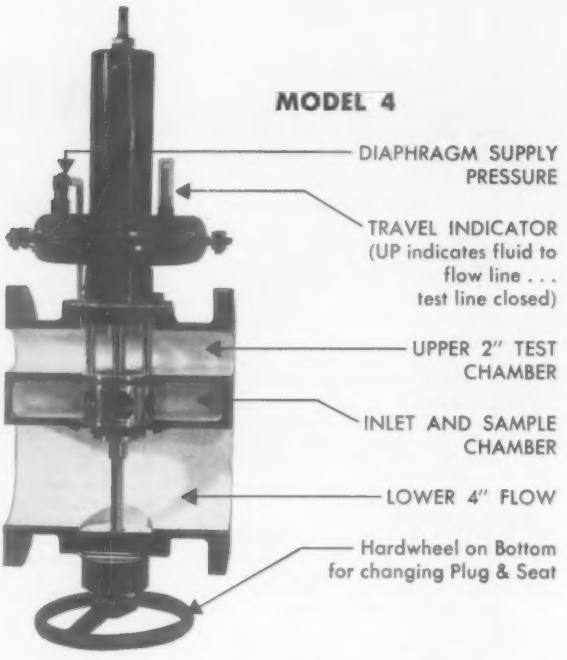
TYPICAL SPECIFICATIONS:

SIZE: 2" screwed inlet — 2" test outlet — 4" flow outlet — ½" sample connection opposite 2" inlet.

WORKING PRESSURE: 600 PSI. Test Pressure 1200 PSI.

MATERIAL: Body and Body Cover Flanges — Ductile Iron. Diaphragm Case — Pressed Steel. Plug, Seat and Cage — Type 303 Stainless Steel. Plug has Buna N synthetic rubber molded to 303 to give some sealing characteristics as "O" ring for tight shut-off. Metal-to-metal contact between plug and seat to prevent extrusion of rubber and to take excess force applied to seat and plug when closed.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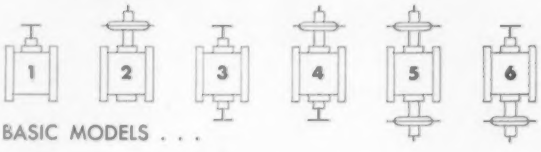
LOWER 4" FLOW
Hardwheel on Bottom for changing Plug & Seat



BASIC MODELS . . .

FACTS:

- COMPACT . . . less space required for complete manifolds
- EXPANSIBLE . . . add a well — add a MANI-FLO
- VERSATILE . . . for line pressures 600 PSI or less:
  a. May be used as a shut-in valve
  b. Six different models for various applications to choose from
- PRACTICAL . . . travel indicator or positive flag
- SALVABLE . . . bolt it in or un-bolt it
- LONG-LASTING SAFETY . . . ductile iron bodies with stainless trim, tested to 3,000 PSI
- ACCEPTED AND APPROVED . . . hundreds in use already
- LOOKS THE PART . . . Judge for Yourself!

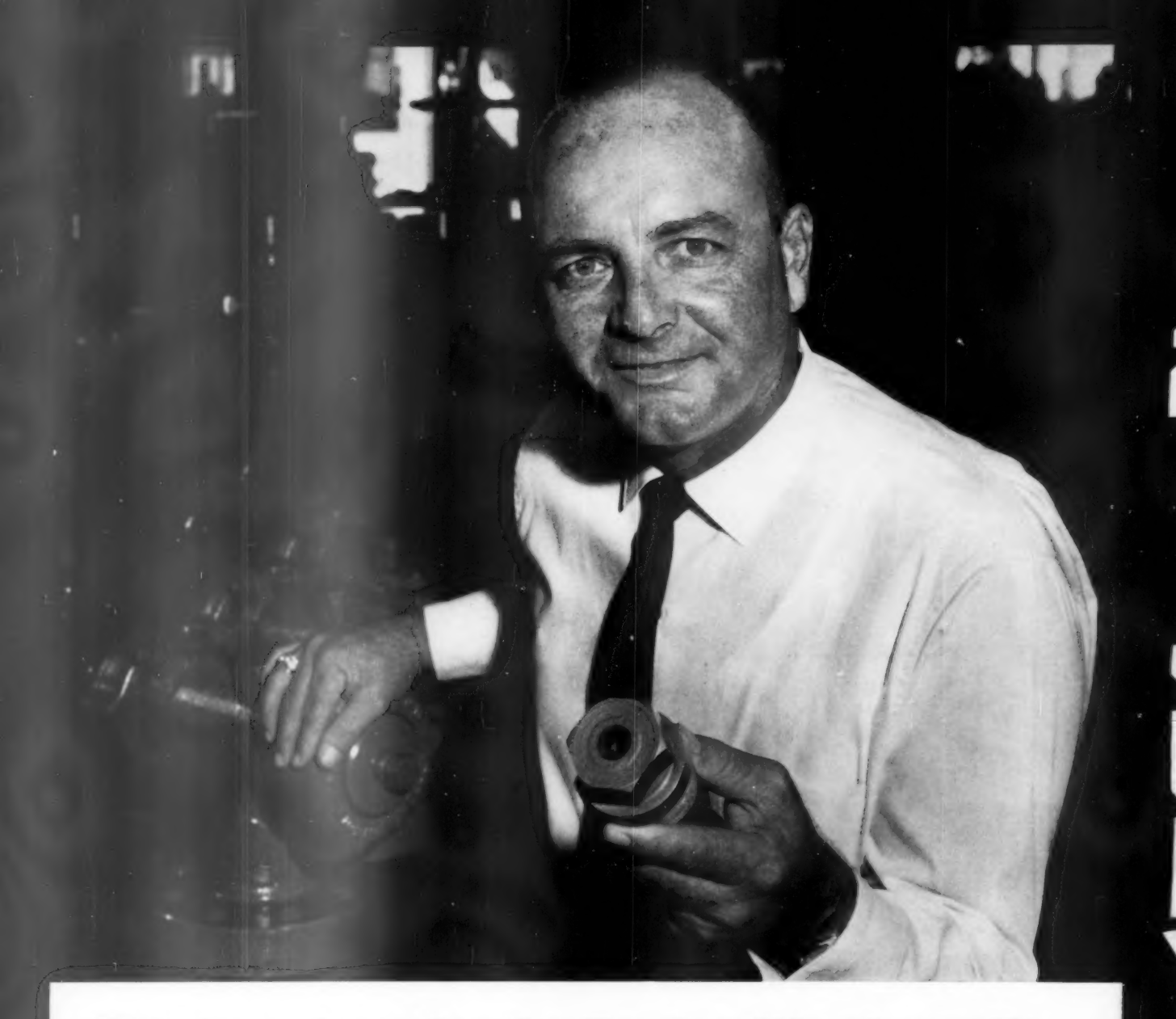
For prices and more information, state model number and quantity. Address . . .

It's a National®

NATIONAL TANK COMPANY

DRAWER 1710

TULSA, OKLAHOMA



This bean lasts for the flowing life of a well!

Low cost, renewable inserts take the cutting action

With ordinary care, a single UNIBOLT Master Bean will last for the entire flowing life of a well. These beans are threaded to receive an inexpensive screw insert. The cutting action of sand-laden production is imposed on the expendable insert, not the master bean.

The inserts are not only inexpensive, they are easier to change than regular beans. Drilled in increments of 5% and 10% of well flow, as well as in increments of 1/64th inch, these inserts provide the versatile range of an adjustable choke with the fine accuracy of a positive orifice.

This is only one of a number of refinements in flow bean design perfected and introduced by UNIBOLT. Others are: shaped entrance to reduce turbulence and maintain flow accuracy, "flow-rating" as a standard inspection procedure to insure correct orifice sizing, and special analysis alloys and heat-treatments for corrosion and wear resistance.

UNIBOLT flow beans are designed to fit only UNIBOLT Positive Choke Bodies and Cage Nipples.

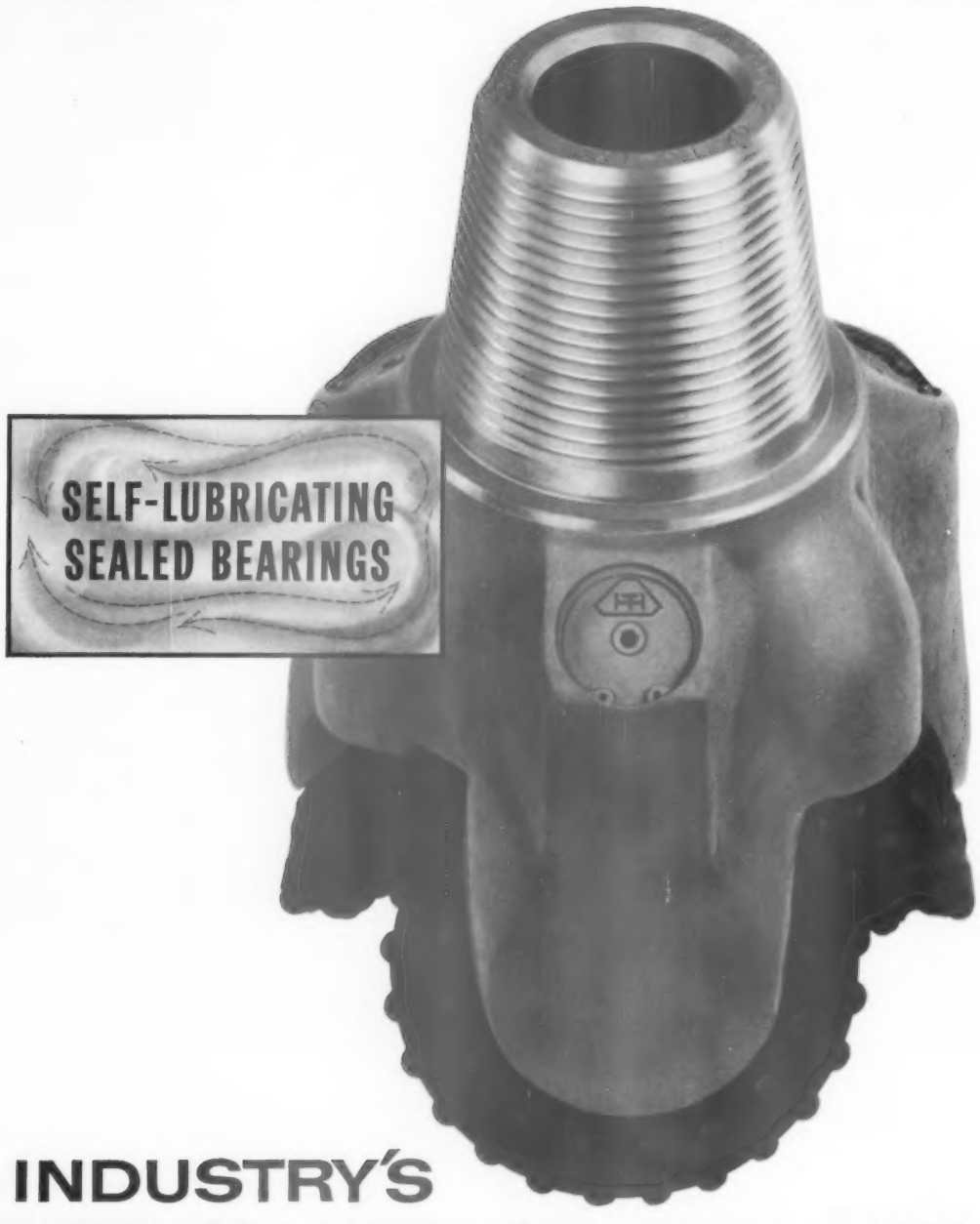
Request UNIBOLT Positive Choke Bodies and Cage Nipples from your Christmas tree supplier and be assured of the finest in dependable flow control.

Unibolt screw inserts are easy to change, and they protect the master bean against cutting.

UNIBOLT

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas



INDUSTRY'S MOST TALKED OF NEW BITS

NOW IN PRODUCTION AT HUGHES

A new kind of Hughes bit – the *self-lubricating* sealed bearing bit – is rolling off the production line. It represents a major design breakthrough in an era of outstanding rock bit research achievements.

Two sizes are available (7⅞" and 8¾") in two types (RG-1XJ and RG-7XJ). By year end, sizes in all existing R-Series types will be expanded to include 7⅞" through 12¼".

Development is continuing in the use of *self-lubricating* sealed bearings in other bit types and in smaller R-Series sizes.

Field reports indicate the *self-lubricating* sealed bearing bits are living up to and frequently exceeding performance expectations. The best results are being obtained where Hughes recommended weights and rpm's are being followed.

You can depend upon Hughes for the latest in rock bits!

HUGHES TOOL COMPANY® *ORIGINATOR AND WORLD'S LEADING DEVELOPER OF CONE-TYPE ROCK BITS*